

SyncWare News

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computers

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A New Thrust

Believe it! After the recent announcement of record sales of the C5 electric car, Sinclair will apparently be starting a new venture in high performance aircraft. Don't let the appearance fool you. This new series of electric aircraft should truly revolutionize the skies. We are told that several QL motherboards keep track of all engine and control functions, providing complete error checking, and navigation aids are stored on one of several microdrives conveniently located in the consol. The aircraft, currently called the C5-A, we understand is capable of very long ranges and a baggage capacity that you would not believe. Full details have not been disclosed, but we believe that more information will be forthcoming by the beginning of next month.

Timex 6820 Computer

Believe it again! Timex has announced their return to the computer world with a 68020 based PC. Timex quit making the 2068 when they realized that technology was moving too fast, and decided instead to regroup their resources and produce a super PC. The Timex 6820 will have a proprietary operating system, TUNIX (Timex Unix). We have been told that it is CPM 80, MSDOS, PCDOS and CPM 68K compatible, and has special software to run Spectrum, 2068 and ZX81 programs directly with no modifications. The CPU will run at 8 MHz switchable to 16 MHz. It comes with some application software and 512K memory, but can handle the full 16 megabytes directly. The display handles only hi res 640x400, but with the optional monitor and memory is capable of 1000x1000 pixels. The supplied language, Super MegaBasic (SMB), is the most complete language available and comes with a compiler and linker. Mass storage is accomplished by the 3" Hitachi disk built in, but space is available to add 8 more drives and a 20 Mbyte hard disk. The TUNIX is supplied on 512K ROM, as is the SMB. We expect to hear more from Timex about this super PC early in April.

Last issue, I made a misleading statement on the front page. I'm afraid that I owe you an apology. I reported that the QL and 520ST were comparable. This is not quite true. The QL is without a doubt the superior of the two with an equal investment in each. Evenmore, when compared to the Amiga (which has a hardware bug that causes system crashes), you could NET three fully outfitted QL's together and save money. The Amiga does indeed have great screen capabilities though. The Psion software package for MS-DOS cost \$700.00 too.

FOR YOUR SUPPORT

This column announces any software, hardware and related modifications that are new or otherwise untested by us. If you have something of interest, we will announce it here. Send us a description of your product (keep it short). We advise readers to send a self addressed and stamped envelope, as a courtesy, to the individuals or companies for information.

G. Russell Electronics, RD1 Box 539, Centre Hall, PA 16828, (814) 364-1325, has the Delta disk interface (with parallel printer port) for the QL for \$219.00 and 512K RAM plug in for \$179.00.

Byte-Back Inc., RT4 Box 54, Leesville, SC 29070, (803) 532-5812, has a real time clock for the ZX81 and 2068. It is battery backed and contains an output latch for external interfacing purposes. It comes with software for the computer you specify. Write for their new catalog for prices.

Variety Sales, 325 W Jersey St. #20, Elizabeth, NJ 07027, (201) 289-5699, has Tech Draw Junior (joystick version) available for \$18.99+\$3.00p&h for the 2068. Write for their new catalog.

Lemke Software Development, 2144 White Oak, Wichita, KS 67207, has Pixel Sketch & Graphics Editor 2.0 available for the 2068. It has 64 column mode and screen dump to a large printer capability. The cost is \$19.95, but if you have version 1, then the upgrade is \$10.95.

Howard Sams & Co., 4300 W. 62nd. St., Indianapolis, IN 46268, (317) 298-5400, has a Computerfact package for the ZX81 (packs for other computers and peripherals too), which contains technical information designed for servicing these computers. The pack contains an original schematic, timing guidelines, oscilloscope outputs from various pins and more. It is available for \$19.95. Call 1-800-428-SAMS.

Hacksel Electronics, 247 Queen St. West, Toronto Ont., Canada M5V 1Z4, (416) 596-1663, has a parallel printer interface that is compatible with Aerco designed software and allows Epson compatible Hi-Res screen dumps. It is available as a cartridge board for \$49.99 and as a rear edge board for \$45.99. Add \$4.00 for p&h.

Fred Nachbaur, Mtn. Stn. Group Box C-12, Nelson, BC V1L 5P1, Canada, (604) 354-3858, has finished the JO Basic, which gives the Video Upgrade (SWN2/1, 2/2) Hi-Res and Sprite control over the TMS9918 co processor. This extended Basic includes much more and is available for \$29.95.

Pete Petri, 11707 Orsinger Ln., San Antonio, TX 78230, (512) 696-1109, has a shifter board for both computers that allows you to use extra keys on big keyboards for shifted functions. Assembled, it is \$14.95 and as a kit \$10.95. Specify your computer.

E. Arthur Brown, 3404 Pawnee Dr., Alexandria, MN 56308, has Hacker's Handbook for those interested in communications for \$16.95. The 32K Non-Volatile Ram is available for \$109.95. Halon fire extinguishers (won't destroy your computer equipment if sprayed) are also available and come in 2 sizes. 1 lb. for \$14.95 and 2 lb. for \$29.95.

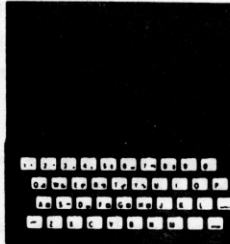
Simulusion, Box 2382, La Jolla, CA 92038, is having a closeout sale of ZX80, ZX81/1000 software, many of which will run in 2K RAM for \$.99 and \$1.79, ZX printer paper, 3 rolls for \$12.00, cassette cases \$.08 each, and more. Write for info. Simulusion will be carrying QL software now too. Write for QL catalog.

Tom Woods, PO Box 64, Jefferson, NH 03583, (603) 586-7734, has an AROS Toolkit available. This 24K program has many built in features (including the Tri base arithmetic in SWN 3/3) and printer drivers. The tape version is available for \$9.95 and the cartridge with 2 eeproms is \$39.95.

Allan Wolach, Dept. of Psychology, Ill. Institute of Technology, Chicago, IL 60616, 312 536 7661 has a 167 page book describing eleven statistical (ANOVA) programs for the 1000 for \$3.50 ppd. The programs are available on cassette for \$10.00.

Don Dailey, 40 Aspen, Great Falls, MT 59405, has a modified operating system for the 1000 that has the Byte-Back Parallel interface routines written over the 2040 printer routines. It is available for \$20.00 ppd.

Time Designs, 29722 Hult Rd., Colton, OR 97017, has a revised and re-edited 2068 Technical Manual available for \$25.00. They have purchased the rest of Dillithium Press' stock of Timex related books. There are some 1000 books left. Write for details.



WOW!

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See September 1984 issue of 73 for TIMEX/RTTY article

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0810	(REG \$3.95)	\$1.95 EA OR 10 FOR \$18.00
08A09	(REG \$19.95)	\$5.95 EA OR 10 FOR \$50.00
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HAL'S COMPUTER GOODIES

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TV/Computer game switch \$3.95

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SOUTHGATE, MICH. 48195
PHONE (313) 285-1782

"HAL" HAROLD C. NOWLAND
W8ZXH

FORUM

Dear Editor, I have a TS1500, 2040 printer and an Aerco disc interface and drives. I have been trying to boot the Chess game onto the disc, but every time I try, the game crashes.

Tom Saine, Wellesley Hills, MA 02181

Try the following listing. Although I haven't proofed it, it should work. This isn't the easiest, but it certainly is short. You need 6 bytes of ram for the code. The pokes to 16388 & 9 are to lower ramtop. This isn't necessary if you have ram available elsewhere. Just change the BASE location.

POKE 16388,127
POKE 16389,127
NEW

10 LET BASE=32760
12 REM RAND AERCO PAGE ADDRESS
15 RAND XXXXX
20 POKE BASE,205
22 POKE BASE+1,71
24 POKE BASE+2,3
26 POKE BASE+3,195
28 POKE BASE+4,PEEK 16434
30 POKE BASE+5,PEEK 16435
32 RAND USR BASE

This program calls 0839d (LOAD next program) and then JUMPs to the page that you want to save the program on. On returning, your program should pick up where it left off from. The operating system always returns to find the next line location for you. This listing should work for any hardware device.

Computerfest Updates

We understand that quite a following of TS loyals will be at the Fest. In conversations with Frank Davis, I was informed of several vendors, user groups and magazines that were slated to appear and set up shop for the week end of May 3rd and 4th.

As a reminder, the Computerfest will be at the Ramada Inn in Sharonville, OH. There is plenty of evening entertainment, and shopping malls are located nearby to appease computer widows, etc. Riverfront Stadium plays host to the Reds and Mets both Saturday and Sunday for afternoon baseball. The Jack Nicklaus Sports Center has 18 holes of golf nearby, and let's face it, there is no reason not to show up and meet us and all of the vendors in person. We expect that there will be plenty of amazing TS demos, and goodies to allay your computer appetite will abound!

Dear Editor, I have a ZX80 and would like to convert it into a ZX81 or 1000. Is it possible? I would also like to know if there is a complete ROM disassembly for the 2068 and if you know of a high resolution light pen for the 2068.

Charles Sullivan, Post, TX 79356

To convert a ZX80, all you need is the 8K ROM. Tom Woods and G. Russell Electronics have an 8K eeprom upgrade that corrects several bugs and adds some improvements. This will give you everything except SLOW mode. Other modifications include cutting the pin 20 trace to the ROM and

jumping a 680 ohm resistor across the cut (SWN 2/1 pg. 19 & 2/2) and running a wire from the ROM out to trace 23B of the edge connector. This will provide the ROMCS capability. Don't forget that the ZX80 is very easy to convert to the Video Upgrade (SWN 2/1, 2/2) that is available as a kit from John Oliger and built from Fred Nachbaur.

There is a bootleg macro-assembly listing for the 2068 that has been passed around the country, but it is worthless. There is a Spectrum Rom disassembly, by Dr. Ian Logan, that is very good, and I recommend highly. This book is available from several distributors in the US. LIST newsletter (SWN vol. 1, pg. 6) and Syntax both published a list of routine address conversions which help make 2068 disassemblies manageable. HOT Z comes with a name file annotation and names the routines right on the screen for you. It is available from Tom Woods.

The only light pen that I know of in this country is available from Zebra Systems, 78-06 Jamaica Ave., Woodhaven, NY 11421, (718) 296-2385. I don't know how Hi-Res it is. Contact them for details.

Watch for Spikes

In several conversations with Wayne Kay, of Smyrna, DE, the questions of electrical spikes came up. Wayne sells surge protectors among other things and was very well versed in the subject. Surge protectors are used to keep electrical spikes from damaging your equipment when your local electric company has troubles, or even when someone nearby turns on a vacuum cleaner. Surge protectors will absolutely extend the life of your computer.

However, there are some areas that are usually overlooked. The inexpensive plug type protector does not have the high speed clamping necessary to protect you from lightning. Since protectors are self-destructing (they take the punishment instead of your computer), when they really do their job they may no longer work. This means that the next strike may get you. They should be tested occasionally. If you see static or similar glitches on your screen when you turn on the vacuum cleaner, then beware.

A near miss by lightning can be very destructive. Lightning strikes at 1/4 mile can create an EMF (electromotive force, or wave of electrons) of 50,000 volts and a fair current to boot. When lightning half scares you out of your wits, it is generally this power surge you feel. This occurs 50 nanosecond to 1 microsecond time frame (1 nanosecond per foot) and is unstoppable.

When lightning hits the power lines, the power company dumps the line to ground and restarts the line again. If the strike is closer to the transformer than your computer, then you are probably safe, although the glitch will crash you. But when the lightning hits the ground, your whole house changes potential (is no longer a good ground) and your computer has +5 volts on one side and +50,000 volts on the other.

Turning off the computer (or printer, modem, etc.) does not help. Most equipment has a switch on the 5 volt (or 120 volt) line, but not on the Ground side. Besides a switch is pretty flimsy protection against a lightning strike.

You must unplug your equipment to protect it!!

Dear Editor, "I have switched from the T/S 1000 to the T/S 2068 two years ago. In all of that time you have had very little in SyncWare News on the later model. I cannot continue to subscribe to your magazine as it wastes my time to read it. You now talk of adding material on the QL. Why? The QL and the TS computers have nothing in common, as far as operation is concerned. This means to me that the situation will get worse."

"I don't intend to get a QL. If I did go to a more advanced computer, it would be the new Spectrum 128"...(need I go on?)

Warren Fricke, 273 Canton St., Depew, NY 14043 (but postmarked from Orlando, Florida)

Rough day, eh? Since we have "Already turned you off," I hope this letter pulls the plug. Go buy a PC and quit wasting my time.

Remember, if you send'em, they might get answered. Take what I said in Forum 3/3 (also last issue) seriously, because I mean it. If you think this magazine is easy (after work and no pay), then start your own newsletter.

FD-68 Info

There is a FD-68 (Aerco Disc) User newsletter available whose purpose is to disseminate ideas and information related to use of both the disc interface and the extra 64K (or 256K) of memory. The first issue discusses the ins & outs of port 244 (bank switcher) and has a routine labeled TASBANK to copy the contents of the 32 to 64K block of ram to the the dock ram and conversions for Artworx and Pro/File 2068.

Contact David Hill, 1159 South Shore Drive #12, Holland, MI 49423, (616) 335-8726 after 5PM. At present, FD-68 User is slated to be a quarterly newsletter.

Astronomy Network

The CAN is a newsletter for Astronomy buffs. This bi-monthly newsletter covers program reviews, a reference guide to related articles in other magazines (and other brands of computers too) and bugs discovered in published programs. Although it is only 4 pages, the \$3.00/6 issues is inexpensive. Interested parties should contact Barry Malpas, 20 Helen St., Warren, NJ 07060.

Dear Editor, I recently started to make some improvements in Mterm II, and I am interested in hearing from anyone who may have already made some changes in Mterm so I need not reinvent the wheel. Changes I am planning include a 42 column screen, 80 column output, macrokey and phone preservation on restart, improved menus, buffer inclusive of variables, redefined keys similar to caps lock in Mscript and possibly ASCII to token translation to port programs from other machines.

Mark Fisher, 700 Erie Ave., Takoma Park, MD 20912

We have a few articles on upgrading Mterm coming. Stay tuned to SWN.

Dear Editor, As a subscriber, I would like to share a non-technical synopsis of John Oliger's disk interface. First, I have purchased several systems, 3 tape recorders, microdrives, A&J Micro drives, Aerco disk drive before getting John's system. The JLO system comprises 2 disk boards and an expansion board that has an rgb output (requires an internal nod to work). The operating system comes on an eeprom on board "B." The DOS is 2068 and Spectrum compatible and works with the A&J (but not the Sinclair microdrives or Tasman I/F [Tasman compatibility requires a mod too.]

The DOS contains a printer driver and can break Spectrum programs with the push of a button (memory snapshot). Unfortunately, the DOS saves only 50K pages to disk as Ray Kingsley's new DOS is not ready yet.

John's system comes as a kit or built. I recommend the built system. I purchased mine (2 disk boards, expansion board and printer board) for \$216.00. Contact John at: John Oliger Co., 11601 Whidbey Dr., Cumberland, IN 46229

Ken Duda, Northlake, IL

Dear Editor, I enjoy using my 2068 and reading SWN, but I am considering getting a QL. I have seen ads for the ICE rom. Do you know anything about it?

W. P. Barton, Fairfax, VA

As a matter of fact, this Forum is being typed on a 640K QL (notice lots of hyphenated words) with an ICE rom attached. ICE is NICE, however to really utilize it to its fullest potential, you should have extra memory. I am multitasking QLWP (Quill) with ICE and notice that all of the commands do slow down, although it is impossible to out type Quill regardless of how slow everything appears. ICE, I understand has been upgraded with several additions. I have not received my update yet, so I can't respond as to their usefulness. The calculator is useless, but file handling is a snap.

Dear Editor, I can't get my Byte-back MD-68 modem to drive a CPI printer. I have tried an Olivetti and Gorilla Banana. My CPI is an Aerco. All components work well with Tasword, but with the Modem attached all I can manage is a locked up screen. I have used Aerco's driver, T. Woods Profile driver and no driver. Can you help?

Joe Bradley, Agawan, MA

First, let's clarify a few terms. CPI I assume means Centronics Parallel Interface. With this device you can drive a parallel printer. If your printer is a serial printer, then you need a serial interface. A modem (MODulate/DEMODulate) is needed to drive a telephone and not a printer. If the MD-68 has an RS232 port on it, then you must use this output for a serial printer. A modem will not drive a CPI or a parallel printer, nor will it drive a serial printer. One other problem associated with serial ports is the non-standard handshaking between printers and other serial devices. The only recourse that you have (and help I can offer) is to get in touch with Byte-Back and ask for help in this modification. If you send them a copy of the specs and

pinout of the connector for your printer, they should be able to assure that the serial port is compatible. Since you also say that your screen locks up, you could have a defective MD-68 as well.



Paul Bingham of Pleasantrees Programming, informed us that the address given in the last issue (Support) had the wrong PO Box number and ZIP. The correct address should have been PO Box 2034, Mesa, AZ 85204. Sorry Paul, but I got your address from SWN 2/2.

The phone number for Steve Wyatt (SWN 3/3 Hot Z comparison) was incorrect also. The correct number was in the Support column though (301-779-7743). Both numbers are technically correct, but he is never in the other end of the house!

BASIC Bank Switching

We have received several letters regarding bank switching on the 2068. SWN 2/3 addresses this prospect from the formal machine code side of the fence, with all of the necessary pushes and calls required to write an independent program. (The only real AROS machine code program is still HOT Z.)

However, you can bootleg around the Exrom code and bank switch from Basic quite easily. Before you bank switch though, you should consider having something to bank switch to. There are a variety of ways to fill extra memory banks on the 2068. The Aerco Disk Interface comes with 64K of RAM located in the dock (cartridge) bank. This is expandable to 256K set up as 4-64K dock banks that are paged in and out by setting the value in an OUT call from machine code to port F4DF and toggling bits 0 and 3.

Another way to add memory (again to the dock bank) would be to convert a 1000 64K rampack (SWN 2/3). You could also add an extra chip to your 2068 and put 56K additional ram in the Exrom Bank (SWN 2/3). With some modifications you can add static ram to a cartridge board, but it will only function as dynamic (it goes away even if you flick off the power) ram due to some quirks in the 2068 hardware.

The last way to add memory to your computer is non-volatile ram. This board is available from several distributors now. This board can run AROS programs from the Exrom bank as well as the dock bank and won't go away if you crash (even in the write mode).

32K BANKED MEMORY

Plugs into the TS2068 cartridge slot. This 32K ram is much more than just a memory. An on board battery keeps it alive even when you turn the computer off. Switch selectable for use in the DOCK or EXROM banks with NO mods to the computer. Write protect switch lets you use memory like an EPROM. Run your own plug-in BASIC programs! Extend capacity by 32K. Reduce or eliminate tape loading time. Detailed instructions include utilities for bank switching and data transfers. The perfect tool for extending your 2068's memory or for writing and debugging EPROM software. A beautiful board: solder masked, gold tipped, satellite grade anti-static coating. Very dependable and rugged. Battery included. Only \$109.95

EXTENDED BASIC

22 new commands for your TS1000! Advanced screen utilities make your ZX81 look more like a monochrome 2068. Includes READ, DATA, RESTORE, FILL MOVE, LEFTS, MIDS, RIGHTS. IN and OUT commands give you Basic control of I/O mapped peripherals which were previously accessed only in machine code. Extended Basic does not require the use of PEEK, POKE, or USR. Takes up just 3.5K of memory. 24 page manual, sample listings included. Unbelievable speed, excellent documentation. NO USR CALLS!! Only \$19.95

WATOR * ZX81!

Now the ZX81/TS1000/1500 has its very own (and very excellent) version of this popular ECOLOGY SIMULATION program; the idea of which first appeared in Oct. '84 Scientific American. WATOR recreates the ecology of 3 interdependent species. You can experiment by changing populations, feed cycles, reproduction, etc. Watch generations pass on the TV screen. Generate HI-RES population curves on the TS2040 printer. Very useful for studying predator/prey relationships. On cassette: Just \$16.95

UNIVERSAL I/O PORT

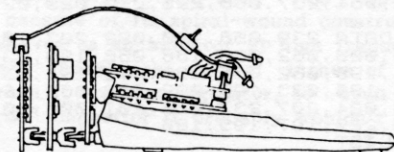
The ideal peripheral for experimentors. Learn to control and sense external devices using your computer. Works with ALL Sinclair/Timex machines. 8 bits parallel input, 8 bits latched output plus 2 handshake lines. Easy to set up or reconfigure many times. This board forms the foundation of a series of software applications which teach concepts of port programming. Choose one application listed below ABSOLUTELY FREE when you order a port board. Only \$69.95 each or 2 boards for \$109.95

APPLICATIONS AVAILABLE NOW!!

*Morse Code Translator for TS2068--Accepts tone decoder input, outputs ENGLISH on the TV screen or printer. Full screen display, auto scrolling. 5K buffer. Unique built-in signal reader aids in detecting/reducing noise from the system. This program is a great tool for learning morse code. Instructions cover set-up, tips for noise reduction, and a detailed tutorial on CW translation theory. Regularly: \$16.95

*Pseudoscope for TS2068--A serial bit stream analyzer which mimics the action of an oscilloscope. Use to graphically portray low frequency digital signals in a horizontally scrolling graph. Program lets you store and compare samples. Print them out on a 2040 printer. Adjustable sample rate, 60hz timing dots are plotted with your input sample. Pseudoscope lets you SEE morse, rtt, serial keyboard signals, etc. as the computer sees them. Very useful in program development or in optimizing interface hardware. Tape/instruction book/full disassembly: \$16.95

*Computer I/O Data Communications--Lets your 2068 speak to your ZX81! Use your TS1000 (must have 64K ram) to store data for your 2068. Send commands which transfer data back and forth, or cause the TS1000 to execute your own special Basic commands. Now 2068 owners can put their old 1000's back on line. Software includes operating systems for both computers. Requires 2 port boards (one for each computer). Tape/instructions: \$16.95.



Please add \$1.50 per order for postage. Phone orders are gratefully accepted. To order, send check, money order, or credit card information to:

Thomas B. Woods

P.O. Box 64, Jefferson, NH 03583

Phone (603) 586-7734

Software & Hardware for
TIMEX-SINCLAIR

Anyway, now that there are so many ways to add memory, let's discuss the basics of bank switching. There are two ports that you need to remember. These are 244 and 255. Port 255 handles various aspects of the operating system, such as, 32/64 column video and dock/Exrom enable. You must take care when toggling this port. Port 244 handles which part of memory that you would like to have in different banks.

The top bit of port 255 is our Ex/dock toggle. This is 80h or 128d. This means that any number greater than 127 (to 255) will mean that if you do any bank switching, it will all be in the Exrom bank. Numbers less than 128 means that any bank switching will be done in the dock bank. Two convenient values to use here are 0 for dock and 128 for Exrom banks. To use these numbers in Basic, just use the out command:

```
OUT 255,0      ;ENABLE DOCK BANK
OUT 255,128    ;ENABLE EXROM BANK
```

The default on power up is having the dock enabled. The computer will automatically run properly coded AROS and LROS programs. However, if you are running a 64 column operating system and you wish to change banks, then you must be careful not to upset the video control flags. In this case you should PRINT IN 255. If this number is less than 128 the dock is enabled, equal or greater means the Exrom bank is enabled. Toggle between banks like this:

```
LET X=IN 255
OUT 255,X+128
```

If you are running LROS software, such as OS64 or a Spectrum emulator other than a Romswitch, you must take care to not use basic to bank switch, because when you change banks, you disable your LROS program and enable the Exrom itself and goodbye!

Unfortunately, you can access only two banks at a time (don't forget the HOME bank--the one that your ram occupies). You cannot have Exrom and dock banks enabled at the same time.

So far, we have just changed the bank that we can enable. We have not actually enabled anything other than our home ram yet. The port that does the turning on of the extra ram is the other port (244). This port is arranged such that each of the 8 bits in the byte turn on a different 8K byte CHUNK. Since there is a BIN function on the 2068, you don't have to remember all of the bits and nibbles etc., just use BIN to send your bits out.

The BIN function translates the numbers you type in such that the first number sets the highest RAM section. The next number sets the next lower 8K chunk, and so on. For example, OUT 244, BIN 11110000 would turn on the four highest chunks in another bank and leave the four bottom chunks in home RAM (and ROM). Remember to type in all 8 ones and zeros when using BIN or you may not set all 8 chunks properly. You can type in less than 8 digits though. Here are some key numbers that you want to remember:

OUT 244,BIN 11 (00000011)	SPECTRUM ROM
OUT 244,BIN 10000	AROS BOOT (32 TO 40K)
OUT 244,BIN 110000	AROS BOOT (32 TO 48K)
OUT 244,BIN 1110000	AROS BOOT (32 TO 56K)
OUT 244,BIN 11110000	AROS BOOT (32 TO 64K)
OUT 244,BIN 11110011	AROS AND SPECTRUM

You can print those BIN numbers to see them in decimal. We have now enabled all kinds of banks and

RAM and not even used one hex number conversion! Practically painless, isn't it?

When you turn on your computer and have an emulator (other than a straight Spectrum Rom) or Aros cartridge plugged in, it autostarts. However, if you have the 32K Non Volatile Ram, Aros programs in the Exrom bank will not auto start. To enable them, just OUT 244,BIN 11110000 (or 240d); OUT 255,128 and RAND USR 32776. Presto! Aros from the Exrom bank.

You should always set your chunks in port 244 before you change banks in port 255. For example, if you have the Aerco Disk interface or emulator, chunk 0 (0 to 8K) is already on in port 244. OUT 255,128 will turn on the Exrom (and turn off your Basic operating system). One problem with crashing in other banks is that there is no cold boot to get you back to basic! Your reset switch will not help you recover. You must pull the plug. This is still another reason to have non volatile ram in your machine.

It is also possible to write, run and EDIT Basic programs that are 100% AROS! The only stipulation is that you must be able to turn off your computer and turn it on without losing your memory contents. Get used to bank switching: It's here to stay! We will discuss bank switching more in the next issue. Have fun!

2068 BUGGY SOFTWARE

It isn't considered normal when a magazine like SyncWare gives you a program that's riddled with bugs. But then, we never promised you a normal magazine. Since this is our special April Fool's issue, we thought we'd introduce you to SyncWare's in house bug. Actually he's a worm--a friendly little fellow--who took up residence in one of Tom Woods' computers. Tom still isn't sure how the worm first got into the computer, but one theory is that it crawled out of the core of an apple Tom left on his desk one night.

Actually, the worm makes quite a nice pet. He does not exhibit the destructive tendencies common to other creatures of the electronic domain. If we could find any fault in our worm, it would have to be his diet. He eats video displays. It seems his passion for pixels is simply unquenchable. Enter him into your TS2068 and see what we mean.

```
1 CLEAR 64390: FOR X=64391 TO
64511: READ Y: POKE X,Y: NEXT X
: RANDOMIZE USR 64391: REM Make
the worm
10 DATA 006,000,062,251,033,00
0,252,119,035,016,252,119,062,25
2,237,071,237,094,033,080,067,03
4,254,255,201,245,042,254,255,06
2,000,190,032,005,241,032,030,02
4,012,126,060,119,040,035,241,19
3,225,241,195,056,000,035,167,22
9,001,255,087,237,066,225,040,04
0,034,254,255,024,234,043,229,00
1,000,064,237,066,225,040,025,02
4
20 DATA 239,058,120,092,203,10
3,040,008,062,086,188,056,199,03
6,024,196,062,065,188,048,191,03
7,024,188,033,120,092,062,064,16
4,103,024,207,237,086,201,000,00
0,245,229,197,195,160
100 LIST
```


ZX81 & QL REGULATOR BUG

Fred Nachbaur

We believe we've found a major reason for mysterious ZX81 (and QL-ed.) problems. When building up a system for a colleague recently, I encountered a problem that plagued one of my other machines, and per reports from the field has given many other users much grief and frustration. When the expansion bus was extended, or if an EPROM was substituted for the ROM, the video display showed severe break-up, with the characters barely readable.

Does your machine have this or a similar problem under certain conditions? Do you suffer from mysterious crashes, even though you KNOW that all connections are secure? Is your display nice and clean one day, then full of garbage the next? Do certain peripherals (e.g. 64K RAM packs) cause video break-up or abrupt crashes? Does your video go for a dump after a few minutes, giving the impression of "over-heating" trouble? If so, you're probably seeing the effect of a serious design flaw in the ZX81 regulator circuitry. The fix is very easy, involving the installation of a single, two-wire, 50 cent component. Before I tell you about the solution, however, first a little background.

Every regulator spec sheet I've ever seen carries an admonition to the effect of, "If the regulator is more than a few inches from the main power supply filter, then the input to the regulator must be bypassed with a small capacitor to prevent spurious oscillation." This is an "everybody-knows" piece of information; it's so "obvious" that none of us have noticed its violation on the ZX81 board. Sinclair Research was apparently "blind" to the problem, as was Timex when they reworked the board.

Any regulator is, essentially, an amplifier; and like all amplifiers, regulators can oscillate (produce spurious frequencies) under certain conditions. Specifically, any inductance (such as a long circuit trace) in the INPUT lead can cause a "complex feedback pole," with resultant oscillation. A small capacitor at the regulator input will prevent this. You guessed it - such a capacitor was omitted on the ZX81/TS1000!

As you probably know, there are two small inductors in series with the power input to this computer. These were apparently an afterthought add-on, since the original ZX81 kit instructions made no mention of these. Their function is to reduce radio interference travelling back through the power-supply line. However, the additional inductance in series with the regulator input only makes matters worse, from the standpoint of regulator stability.

There IS a bypass capacitor at the regulator input, but it is a large electrolytic unit. This type of capacitor, because of its spiral-wound construction, actually behaves as an inductor at high frequencies! Furthermore, there are several inches of circuit trace between it and the regulator, so even if it were a "true" capacitor it probably wouldn't do much good.

The resulting problem is especially pernicious in that it only affects SOME regulators on SOME machines. Swapping chips (ULA or CPU) or slightly changing the hardware configuration can cause a change in the observed symptoms, which can lead you to believe that you've narrowed the problem down. The problem still exists, and can re-appear with temperature changes, different peripherals, even line-voltage changes.

The fix is to install a small (.1 - 2.2 uF, 16 volts or better) tantalum or ceramic capacitor directly across the regulator input. Solder the capacitor directly to the regulator leads, on the underside of the board. I recommend the slightly more expensive tantalum type, both for its small size and for its excellent performance at high frequencies. The "-" lead goes to the centre regulator terminal, and the "+" lead goes to the regulator input (the terminal farthest from the edge of the board). You might be amazed at the effect that this can have; I was. A machine that crashed when the cat walked by and had an atrocious display when it did work, was miraculously transformed into a stable, crystal-clear dream machine in less than a minute.

By the time they designed the TS1500, Timex had gotten a little smarter. They included a small tubular capacitor in addition to the large electrolytic, so this is unlikely to be a problem. However, it is not located directly at the regulator input, so it could be viewed as a "bare-minimum" solution. It can't hurt to install a small tantalum right across the regulator just to be sure. On the 1500, the input lead is the one closest to the keyboard connector.

Apparently, the QL suffers this same design flaw. I recently installed a 512K RAM board inside my QL. The only extra part I received was a .1 uF disc cap to be tacked across the 5 Volt regulator. You guessed it, from the 9 Volt input to ground. My QL suffered frequent "walk-by" crashes before this cap retrofit. Now it runs without pause, regardless of the static in the air. Place the cap across the pin closest to the reset button and the center pin. I think Sinclair Research could use a good analog man-ed.

Similarly, the TS2068 seems to be adequately bypassed throughout. However, it's no secret that it, too, suffers from dirty video. Since it uses a switching regulator, the matter is complicated somewhat; I haven't had any success in cleaning up the display with additional bypassing. One report indicated that using nice, fat wires to parallel the narrow 5-volt circuit traces improved matters; interestingly, this had already been done by Timex on my machine. John Olliger reports improvement by getting rid of the switching regulator circuit, replacing it with a good old analog regulator with a big heat-sink. Another (untried) suggestion was to synchronize the CPU clock with the video chroma oscillator. This could be done with a 4x frequency multiplier on the 3.57... video crystal, to replace the 14.112 CPU crystal. Does anyone out there have a workable design for this? Any other ideas?

2068 TOWER OF BRAHMA

M. E. LaVerne

The Tower of Brahma (also known as the Tower of Hanoi) is an old game, but is presented here with a new twist. Naturally, we leave the work to the computer. This program visually solves the tower problem by using a technique called recursion. The Recur subroutine keeps calling itself until it gets to the bottom of the pile and then keeps returning as it backs its way up the pile again.

Recursion is the method by which all of the Sinclair operating systems parse through a Basic line. The Line Scanning routine in the operating system looks at every character in turn until it gets to the end of the Basic statement, all the while pushing the relevant data onto the stack. When the end of the Basic line is reached, the system then backs everything off of the stack and acts as required on the data.

By understanding the working of this program you will understand what recursion is. For repetitive processes such as the tower, a Basic line or even an RPN calculator, recursion can make your program quite small.

```

10 REM Program BRAHMA
20 REM © M. E. LaVerne
30 REM May 1985
40 GO TO VAL "400": REM Initialize
50 REM * Subroutine UPDATE *
60 REM Print current move
70 LET MOVE=MOVE+C1: PRINT AT
  VAL "19", VAL "5": MOVE; TAB VAL "1
  6": FROM; TAB VAL "25": TO
80 PAUSE VAL "20": REM Hold a
  r a mo
90 REM Find disk to be moved
100 FOR I=C1 TO C3
110 IF P(FROM, I) > C0 THEN LET NF
  ROM=I: LET I=C3
120 NEXT I
127 REM Delete disk
130 PRINT AT NFROM+C3, VAL "10"*
  FROM-C3; B$
132 REM Find new location for d
  isk
135 FOR I=C3 TO C1 STEP -C1
140 IF P(TO, I)=C0 THEN LET NTO=
  I: LET I=C0
145 NEXT I
147 REM Move disk; update place
  array
150 PRINT AT NTO+C3, VAL "10"*TO
  -C3; C$(P(FROM, NFROM))
155 LET P(TO, NTO)=P(FROM, NFROM)
  : LET P(FROM, NFROM)=C0
160 PAUSE VAL "40": REM Hold it
  a mo
165 RETURN
200 REM * Subroutine RECUR *
202 REM If we're down to the
  bottom disk, move it from source
  to target pin
205 IF DISK=C1 THEN LET FROM=S(
  DISK): LET TO=T(DISK): GO SUB UP
  DATE: RETURN
207 REM Otherwise, move DISK-1
  disks from source to median pin
210 LET DISK=DISK-C1
215 LET S(DISK)=S(DISK+C1)
220 LET M(DISK)=T(DISK+C1)
225 LET T(DISK)=M(DISK+C1)
230 GO SUB RECUR
232 REM Now move remaining disk
  from source to target pin
235 LET FROM=S(DISK+C1)
240 LET TO=T(DISK+C1)
245 GO SUB UPDATE
247 REM Then, move DISK-1 disks
  from median to target pin
250 LET S(DISK)=M(DISK+C1)
255 LET M(DISK)=S(DISK+C1)

```

```

260 LET T(DISK)=T(DISK+C1)
265 GO SUB RECUR
270 LET DISK=DISK+C1: RETURN
300 REM * * Program MAIN * *
305 PRINT AT C0, C3; "TOWER OF BR
  AHMA"
310 INPUT "How many disks? "; DI
  SK
315 PRINT AT C2, VAL "6": "Number
  of disks ="; DISK; " "
320 IF DISK < C1 THEN PRINT AT C4
  , C0; "Too few disks; minimum=1":
  PAUSE VAL "90": GO TO MAIN
325 IF DISK > C3 THEN PRINT AT C4
  , C0; "Too many disks; maximum=8":
  PAUSE VAL "90": GO TO MAIN
330 PRINT AT C4, C0; A$
335 DIM S(DISK): DIM M(DISK): D
  IM T(DISK): DIM P(C3, C3)
340 LET S(DISK)=C1: LET M(DISK)
  =C2: LET T(DISK)=C3
345 LET MOVE=C0: LET I1=C12-DIS
  K
350 FOR I=C3 TO I1-C2
355 PRINT AT I, C2; A$: NEXT I
360 PRINT AT I1-C1, C2; B$; TAB C1
  2; B$; TAB VAL "22": B$
365 FOR I=I1 TO VAL "11"
370 LET P(C1, I-C3)=I-I1+C1
375 PRINT AT I, C2; C$(I-I1+C1); T
  AB C12; B$; TAB VAL "22": B$: NEXT
  I
380 PRINT AT C12, C0; D$; D$; AT VA
  L "15", VAL "6"; E$; AT VAL "17", C4
  ; F$; AT VAL "18", C2; G$
385 GO SUB RECUR
390 PRINT AT VAL "21", C0; "Done.
  To retry: CONT, ENTER"
395 STOP: CLS: GO TO MAIN
400 REM * * Initializer * *
402 REM Set entry points, const
  ants
405 LET UPDATE=VAL "100": LET R
  ECUR=VAL "200": LET MAIN=VAL "30
  0": LET C0=PI-PI: LET C1=SGN PI:
  LET C2=VAL "2": LET C3=VAL "3":
  LET C4=VAL "4": LET C3=VAL "8":
  LET C12=C4+C3
407 REM Set UDGs
410 CLS: RESTORE: DIM C$(C3, V
  AL "9")
415 FOR I=C0 TO VAL "39": READ
  A$
420 POKE USR "A"+I, VAL A$: NEXT
  I
422 REM Set graphics strings
425 LET A$="": LET B$="
  "
430 LET C$(C1)="
  "
435 LET C$(C2)="
  "
440 LET C$(C3)="
  "
445 LET C$(C4)="
  "
450 LET C$(VAL "5")="
  "
455 LET C$(VAL "6")="
  "
460 LET C$(VAL "7")="
  "
465 LET C$(C3)="
  "
470 LET D$="
  "
475 LET E$="1
  2
  "
480 LET F$="Move
  From Pin
  To Pin"
485 LET G$="
  "
490 GO TO MAIN
500 REM * * Data Section * *
505 DATA "126", "126", "126", "126"
  "126", "126", "126", "126"
510 DATA "15", "15", "15", "15", "1
  5", "15", "15", "0"
515 DATA "240", "240", "240", "240"
  "240", "240", "240", "0"
520 DATA "255", "255", "255", "255"
  "255", "255", "255", "0"
525 DATA "0", "0", "0", "255", "255", "0"
  "0", "0", "0"
600 OUT 244, 1: MOVE "brahma.bas"
  "10: OUT 244, 0: STOP
610 SAVE "brahma" LINE 10

```


1000 AUTO ANALYSIS

Edward Pardo

Analysis can be used to put your computer to work for you in the garage. This listing is from a 1000 version, but it uses no tricks. It will run as is on any computer that you enter the listing on. It has been designed to step you through the diagnostics of auto repair in the proper sequence of events. This sequence will change, of course, from auto to auto, but by using this program as a guide, you should reduce the time taken to properly pinpoint your car's problems.

```

1 REM "ANALYSIS" 1983
2 LET X=0
3 LET Y=0
4 LET Z=0
5 LET Q=0
6 LET V=0
7 LET C=0
8 LET N=0
10 LET SM=500
11 LET LG=0
12 LET SUM=0
13 LET CC=1
40 PRINT AT 5,2;"AUTOMOTIVE ANALYZER PART 1:"
45 PRINT ,TAB 6;"TROUBLESHOOTING"
50 PRINT ,TAB 2;"PROGRAM BY E. PARDO, BS, SAE"
55 PRINT ,TAB 2;"PRESS ENTER WHEN EVER THERE ARE NO OTHER INPUT INSTRUCTIONS."
60 INPUT A$
90 CLS
99 REM MENU=LETTER SELECTOR
100 PRINT "AUTOMOTIVE ANALYZER MENU"
122 PRINT "A. STARTER DOES NOT TURN"
123 PRINT "B. STARTER TURNS,BUT ENGINE DOES NOT CRANK"
124 PRINT "C. STARTER TURNS ENGINE SLOWLY"
125 PRINT "D. STARTER CRANKS NO NORMAL SPEED"
126 PRINT "E. STARTER CRANKS ENGINE, BUT FASTER THAN NORMAL"

```

```

127 PRINT "F. ENGINE FIRES INTERMITTANTLY"
128 PRINT "G. ENGINE FIRES CONSTANTLY"
142 PRINT "H. HARD STARTING, STALLING, OR LACKS POWER."
143 PRINT "I. BLUE SMOKE"
144 PRINT "J. BLACK SMOKE, ROUGH IDLE, ENGINE DIES AT HIGH SPEED, POOR PICKUP, HESITATION"
145 PRINT "K. BACKFIRE/AFTERFIRE"
146 PRINT "L. MISS-FIRES AT SPEED (CRUISE)"
147 PRINT "M. RUN-ON (DIESELING)"
148 PRINT "N. MISS-FIRES UNDER LOAD"
149 PRINT "P. MISS-FIRES AT IDLE"
150 PRINT "X. EXIT ANALYSIS"
151 INPUT A$
152 GOSUB 8000
190 CLS
195 GOTO N
1000 REM STARTS TROUBLESHOOTING
1001 CLS
1003 PRINT "ENTER CODE FROM MENU LISTING:"
1004 PRINT AT 3,7;"BATTERY AND CABLES"
1005 PRINT AT 6,2;"ENTER 0 TO CONTINUE."
1011 PRINT "VISUAL BATTERY INSPECTION"
1012 PRINT "CHECK CABLE TERMINAL CONNECTIONS"
1013 PRINT "INSPECT CABLES"
1014 PRINT "HYDROMETER TEST"
1016 INPUT S
1017 IF S=0 THEN GOTO 1021
1018 GOSUB (S*10+1100)
1019 INPUT A$
1020 GOTO 1000
1021 GOTO 9000
1022 PRINT "TEST THE STARTER MOTOR:"
1023 PRINT ,TAB 0;"CONNECT JUMPER FROM

```

To clear up any confusion that may occur in the listing, the inverse statements are given by line number.

```

100 AUTOMOTIVE ANALYSIS MENU (EAP)
150 EXIT ANALYSIS
1011 VISUAL BATTERY INSPECTION
1012 CHECK CABLE TERMINAL CONNECTIONS
1013 INSPECT CABLES
1014 HYDROMETER TEST
1041 CHECK SPARK
1051 CHECK FUEL SYSTEM
1061 CHECK COMPRESSION
1071 VACUUM TEST
1081 CHECK IGNITION TIMING
1092 CHECK VALVE TRAIN
1162 GOOD FAIR POOR BAD
1171 RECHARGE BATTERY
1172 BATTERY IS OK
1187 PROBLEM INDICATED IN STARTER
2001 CAUTION WEAR GLOVES
2008 CODE CONDITION
2016 ENTER LINE NUMBER
2021 NORMAL WEAR
2026 CARBON FOULING
2031 OIL FOULING
2036 LEAD FOULING
2038 COMBUSTION BY-PRODUCTS
2041 BRIDGED GAP

```

```

2042 REPLACE SPARK PLUGS
2046 OVERHEATING
2051 PREIGNITION
2104 IS SPARK GOOD?
2301 IGNITION COIL RESISTANCE CHECK
2307 IF VOLTMETER SWINGS UP SCALE WHEN ENGINE IS CRANKED THE POLARITY IS CORRECT
2500 INSPECT SPARK PLUG CABLES
3006 ENTER RESULTS
3021 REPLACE FUEL FILLER CAP
3053 1. VAPOR LOCK
3059 2. CARBURATOR ICING
3063 3. FUEL CONTAMINATION WITH WATER
4000 DISABLE IGNITION SYSTEM
4002 & 4055 ENTER
4025 EXCESSIVE COMPRESSION IMBALANCE
4026 ACCEPTABLE COMPRESSION BALANCE
4027 COMPRESSION WELL BALANCED
4028 & 4029 CAUTION
4500 END COMPRESSION TEST
5002 & 5110 GAUGE READS INDICATIONS
5114 BACK PRESSURE CHECK
6004 SPECS FOR DISTRIBUTOR ADVANCE MAY BE GIVEN IN CRANKSHAFT OR IN DISTRIBUTOR DEGREES/RPM (1/2)
7002 STOP ENGINE
7006 IF NOISE PERSISTS, CHECK CAMSHAFT

```

```

THE BATTERY POWER TERMINAL TO THE IGNITION + TERMINAL OF STARTER
RELAY OR SOL"
1023 PRINT "DOES ENGINE CRANK
NORMAL? (Y/N)"
1024 INPUT A$
1025 IF A$="Y" THEN GOSUB 1130
1026 IF A$="N" THEN GOSUB 1185
1027 INPUT A$
1028 IF A$="C" THEN LET X=1041
1029 IF A$="C" THEN LET Y=1061
1030 GOTO 9000
1032 PRINT "WITH THE IGNITION ON
CONNECT A JUMPER FROM COIL - A
ND GROUND. REMOVE HIGH VOLT WIR
E FROM COIL."
1033 PRINT "CONNECT TEST LIGHT
TO COIL + AND GROUND, TURN IGN O
N AND JIGGLE THE KEY."
1034 PRINT "DOES THE LAMP LIGH
T? (L); FLICKER? (F); OR DO NOTHING?
(N)."
1035 INPUT A$
1036 IF A$="L" THEN GOSUB 1190
1037 IF A$="F" THEN GOSUB 1210
1038 IF A$="N" THEN GOSUB 1220
1039 INPUT A$
1040 GOTO 9000
1041 PRINT "CHECK SPARK"
1042 GOSUB 2000
1043 INPUT A$
1044 CLS
1045 PRINT "DO YOU WISH TO:"; TAB
5; "CONTINUE? (C)"; TAB 5; "RETURN
TO SPARK CHECKS? (R)"
1046 INPUT A$
1047 CLS
1048 IF A$="R" THEN GOTO 1041
1050 GOTO 9000
1051 PRINT "CHECK FUEL SYSTEM"
1052 GOSUB 2900
1059 INPUT A$
1060 GOTO 9000
1061 PRINT "CHECK COMPRESSION"
1062 GOSUB 4000
1069 INPUT A$
1070 GOTO 9000
1071 PRINT "VACUUM TEST"
1072 GOSUB 5000
1079 INPUT A$
1080 GOTO 9000
1081 PRINT "CHECK IGNITION TIMING"
1082 GOSUB 6000
1089 INPUT A$
1090 GOTO 9000
1091 PRINT "CHECK VALVE TRAIN"
1092 GOSUB 7000
1099 INPUT A$
1100 GOTO 9000
1110 REM BEGIN TS SUBROUTINES
1111 CLS
1112 PRINT "REPLACE BATTERY WITH
HEAVY DUTY"
1113 PRINT "TYPE, THEN CHECK CHA
RGING SYSTEM"
1114 INPUT A$
1115 GOSUB 1150
1119 RETURN
1121 CLS
1122 PRINT "CHECK FLUID LEVEL:"
1123 PRINT "IF LOW, TOP OFF WI
TH DISTILLED WATER AND CHARGE B
ATTERY; THEN"
1124 PRINT "CHECK CHARGING SYSTE
M"
1125 PRINT "CLEAN BATTERY WITH
BAKING SODA / WATER SOLUTION"
1126 PRINT "COAT TERMINALS WIT
H VASOLINE"
1127 INPUT A$
1131 CLS
1132 PRINT "INSERT SCREWDRIVER B
ETWEEN CABLECLAMP AND TERMINAL P
OST. TURN ON HIGH BEAMS AND OBSER
VE INTENSITY OF LIGHT, TWISTING SC
REWDRIVER"
1133 PRINT "IF LIGHTS BRIGHTEN
, CLEAN POSTS AND CABLE CLAMPS."
1134 PRINT "DID LIGHTS BRIGHTEN?
(ENTER Y/N)"
1135 INPUT A$
1137 IF A$="N" THEN GOSUB 1160
1151 CLS
1152 PRINT "CHECK CABLES:"
1153 PRINT "VISUALLY INSPECT C
ABLES FOR BAD GROUND, CRACKS, BAD
STARTER CONN."
1154 PRINT "TIGHTEN OR REPLACE A
S NEEDED"
1155 PRINT "IF PROBLEM IS STIL
L UNKNOWN THEN PROCEED TO NEXT ST
EP"
1159 RETURN
1160 CLS

```

```

1161 PRINT "FOR HYDROMETER WITHO
UT NUMERIC INDICATORS, INTERPET
FROM SCALE"
1162 PRINT "1.25>1.3", "1.25<1.25", "1.15>1.2", "1.15<1.15"
1163 PRINT "ENTER SPECIFIC GRA
VITY:"
1164 INPUT S
1165 PRINT S
1166 PRINT "ENTER TEMPERATURE
DEG. F."
1167 INPUT F
1168 PRINT F
1169 LET CS=((F-80)*.0004)+5
1170 PRINT "CORRECTED READING="
; CS
1171 IF CS<1.225 THEN PRINT "B
ATTERY BATTER"
1172 IF CS>1.225 THEN PRINT "B
ATTERY BATTER"
1178 INPUT A$
1179 RETURN
1180 PRINT "1. CHECK NEUTRAL ST
ART SWITCH(S)"
1181 PRINT "2. CHECK IGNITION S
WITCH"
1184 RETURN
1185 PRINT "CAN ENGINE BE TURN
ED BY HAND?"
1186 INPUT A$
1187 IF A$="Y" THEN PRINT "RECEI
VE INSTRUCTIONS IN CHAPTER 2"
1188 IF A$="N" THEN PRINT "REMOV
E SPARK PLUGS AND CRANK THE ENGIN
E."; TAB 0; "IF IT DOESN'T TURN-OVE
R NOW, THEN DISASSEMBLY IS REQUIR
ED."; TAB 0; "IF THE ENGINE CRANKS
ENTER "C" "
1189 RETURN
1190 PRINT "LIGHTS= SWITCH IS
OK."
1191 PRINT "CHECK FOR OPEN CIR
CUITS:"; TAB 5; "1. BALLAST RESIST
OR"; TAB 5; "2. RESISTANCE WIRE HA
RNESSES"; TAB 5; "3. MAIN RELAY, ENGI
NE FUSE"
1192 PRINT "CHECK DISTRIBUTER:";
TAB 5; "3. CONTACT POINTS"; TAB 5;
"4. SIGNAL GENERATOR"
1193 PRINT TAB 5; "5. CONDENSOR";
TAB 5; "6. IGNITER (TRANSISTORIZED)"
1209 RETURN
1210 PRINT "FLICKERS= REPLACE
THE IGNITION SWITCH"
1219 RETURN
1220 PRINT "NO RESPONSE= CHECK
FOR LOOSE OR OPEN CONNECTIONS"
1221 PRINT "IF NONE ARE FOUND, RE
MOVE THE IGNITION SWITCH AND CHECK FOR
CONTINUITY. IF NO CONTINUITY REP
LACE SWITCH."
1239 RETURN
2000 PRINT "HOLD EACH PLUG CAB
LE ABOUT 1/4" FROM GROUND AND C
RANK ENGINE"
2001 PRINT "IS THERE SPARK? (Y/N)"
2002 PRINT "IS THERE SPARK? (Y/N)"
2003 INPUT A$
2004 IF A$="N" THEN GOTO 2200
2005 PRINT "IS SPARK GOOD TO ALL
CYLINDERS?"
2006 INPUT A$
2007 IF A$="N" THEN GOTO 2100
2008 PRINT "REMOVE AND CHECK S
PARK PLUGS:"
2009 PRINT "2.0 ELECTRODES EROD
ED, BROWN"
2010 PRINT "2.5 CARBON FOULED, (
DRY BLACK)"
2011 PRINT "3.0 OIL FOULED, (WET
BLACK)"
2012 PRINT "3.5 LEAD FOULED, GLA
ZED"
2013 PRINT "4.0 BRIDGED GAP, (SH
ORTED)"
2014 PRINT "4.5 BURNED ELECTROD
ES, WHITE"; TAB 6; "INSULATOR WITH
BLACK SPOTS"
2016 PRINT "5.0 MELTED OR BADLY
BURNED"; TAB 5; "ENTER LINE 1153"
2017 INPUT S
2018 GOSUB (S*10+2000)
2019 RETURN
2020 CLS
2021 PRINT "NORMAL WEAR OF STA
NDARD PLUGS IS INDICATED BY 0.001
PER 1000 MILES OF USE"
2023 PRINT "CLEAN AND RECAP IF
WEAR IS NOT EXCESSIVE, OR REPL
ACE"

```



```

2024 RETURN
2025 CLS
2026 PRINT "CHECK FOR RESISTANCE BETWEEN +/- COIL PRIMARY TERMINALS."
2027 PRINT "IF PRESENT ON ONE OR TWO PLUGS; TAB 5; CHECK CORD SET; TAB 5; CHECK VALVE TRAIN"
2028 PRINT "PRESENT ON MOST PLUGS=TOO RICH; TAB 5; CHECK FUEL SYSTEM"
2029 RETURN
2030 CLS
2031 PRINT "WORN ENGINE COMPONENTS OR ENGINE BREAK-IN ON NEW OR REBUILT MOTOR"
2032 PRINT "TAB 5; CHECK VACUUM; TAB 5; CHECK COMPRESSION; TAB 5; REPLACE SPARK PLUG"
2033 RETURN
2034 CLS
2035 PRINT "CAN BE GRAY, BLACK, RED, GREEN, TAN OR YELLOW DEPOSITS WHICH APPEAR GLAZED OR CINDER-LIKE."
2036 PRINT "TAB 5; REPLACE WITH NEW PLUGS."
2037 RETURN
2038 CLS
2039 PRINT "DEPOSIT LODGED BETWEEN ELECTRODES"
2040 PRINT "INCOMPLETE COMBUSTION;"
2041 RETURN
2042 CLS
2043 PRINT "BURNT ELECTRODES (BURNT ELECTRODES)"
2044 PRINT "1) TOO MUCH ADVANCE; CHECK TIMING 2) MIXTURE TOO LEAN; FUEL SYSTEM 3) SPARK PLUGS NOT SEATED TIGHT; CLEAN SEAT, REPLACE PLUGS"
2045 RETURN
2046 CLS
2047 PRINT "MELTED OR SEVERELY BURNT ELECTRODES, BLISTERED OR CRACKED INSULATORS, OR METALLIC DEPOSITS ON THE INSULATOR."
2048 PRINT "1) INCORRECT HEAT RANGE PLUGS. 2) TOO MUCH DISTRIBUTOR ADVANCE. 3) PLUGS NOT COOLING PROPERLY"
2049 PRINT "CHECK PLUG SEAT AND COOLANT. 4) FUEL MIXTURE TOO LEAN. 5) CHECK COMPRESSION. 6) OCTANE TOO LOW."
2050 RETURN
2051 PRINT "INSPECT DISTRIBUTOR CAP + ROTOR FOR BURNED OR CORRODED CONTACTS, CRACKS, CARBON TRACKS, OR MOISTURE"
2052 PRINT "CHECK THE FIT OF THE ROTOR ON THE DISTRIBUTOR SHAFT."
2053 PRINT "IF MOISTURE PRESENT, DRY + RETEST AS DESCRIBED ABOVE."
2054 PRINT "IF PROBLEM FOUND, REPLACE PARTS + RETEST"
2055 PRINT "YES (Y/N)"
2056 INPUT A$
2057 CLS
2058 IF A$="Y" THEN GOTO 2008
2059 IF A$="N" THEN GOTO 2300
2060 PRINT "DOES VEHICLE HAVE TRANSISTORIZED IGNITION? (Y/N)"
2061 INPUT A$
2062 IF A$="Y" THEN GOTO 2300
2063 PRINT "CHECK FOR SPARK AT COIL WIRE."
2064 PRINT "(SAME AS FOR PLUG WIRE)"
2065 PRINT "IF SPARK IS WEAK OR NO SPARK, REPLACE WIRE AND RETEST."
2066 PRINT "DID YOU CHECK CAP AND ROTOR? (Y/N)"
2067 INPUT A$
2068 CLS
2069 IF A$="N" THEN GOTO 2100
2070 CLS
2071 PRINT "CONNECT OHMMETER TO TOWER; TAB 5; AND TO COIL NEG. (-) TERM."
2072 PRINT "READING SHOULD BE >4K OHM, <12K OHM; EXCEPT FOR HEI IGNITION."
2073 PRINT "(FOR HEI, >6K, <30K)"
2074 PRINT "HIGH PERFORMANCE COILS DIFFER, CHECK MANUFACTURER'S SPECS."

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2305 PRINT "CHECK COIL POLARITY."
2306 PRINT "CONNECT VOLTMETER NEGATIVE LEAD TO HIGH VOLT TOWER, AND POSITIVE LEAD TO GROUND."
2307 PRINT "YES (Y/N)"
2308 INPUT A$
2309 CLS
2310 PRINT "CHECK FOR BRITTLENESS OR CRACKS."
2311 PRINT "CHECK CORDS WITH AN OHMMETER."
2312 PRINT "CHECK FOR OPEN CIRCUITS OR FOR RESISTANCE OVER 3000 OHMS/FT."
2313 PRINT "IF ANY CABLE IS BAD, REPLACE THE ENTIRE CORD SET."
2314 RETURN
2315 PRINT "CHECK AIR FILTER ELEMENT FOR EXCESSIVE DUST OR RESTRICTIONS"
2316 PRINT "CLEAN OR REPLACE ELEMENT"
2317 PRINT "IS ENGINE FUEL-INJECTED? (F) OR CARBURETRED? (C)"
2318 INPUT A$
2319 IF A$="F" THEN GOTO 3030
2320 CLS
2321 PRINT "CHECK FOR FUEL IN CARBURETOR."
2322 PRINT "A. CHECK FOR FLOODED CARBURETOR (STRONG ODOR, FUEL VISIBLE INSIDE INTAKE MANIFOLD)"
2323 PRINT "B. CHECK FOR ABSENCE OF GASOLINE IN THE CARBURETOR. OPERATE THE THROTTLE LINKAGE AND OBSERVE THE FUEL SPRAY FROM ACCELERATOR PUMP"
2324 PRINT "FLOODING? (F); TAB 5; NO FUEL? (N); TAB 5; OK? (K)"
2325 INPUT A$
2326 IF A$="F" THEN GOTO 3027
2327 IF A$="K" THEN GOTO 3070
2328 CLS
2329 PRINT "CHECK FUEL DELIVERY: DETACH FUEL LINE AT CARB INLET, AIM LINE INTO CONTAINER AND CRANK ENGINE"
2330 PRINT "DOES FUEL FLOW FREELY? (Y/N)"
2331 INPUT A$
2332 IF A$="Y" THEN GOTO 3028
2333 PRINT "REMOVE LINES FROM FUEL PUMP; WITH VACUUM/PRESSURE GAUGE CHECK PUMP"
2334 PRINT "IF PUMP DOES NOT DEVELOPE VACUUM AT INLET REPLACE THE PUMP."
2335 PRINT "(CHECK FUEL PRESSURE AT OUTLET AND COMPARE READING AGAINST OEM SPECIFICATIONS)"
2336 PRINT "IF PUMP IS OK, CHECK GAS DELIVERY WITHOUT THE FILLER CAP INSTALLED"
2337 PRINT "DOES FUEL FLOW FREELY? (Y/N)"
2338 INPUT A$
2339 IF A$="Y" THEN PRINT "REPLACE FILLER CAP"
2340 IF A$="N" THEN RETURN
2341 CLS
2342 PRINT "BLOW OUT THE FUEL LINES TO THE TANK WITH LOW PRESSURE AIR UNTIL BUBBLING IS HEARD AT FILLER NECK THEN CLEAN OUT FUEL LINE TO CARB AND REPLACE FUEL FILTER."
2343 INPUT A$
2344 GOTO 3050
2345 CLS
2346 PRINT "CHECK THE FLOAT NEEDLE AND SEAT"
2347 PRINT "TAP CARBURETOR NEAR INLET. IF IT STOPS CONDITION REPLACE NEEDLE AND SEAT."
2348 PRINT "NOTE: WHEN REPLACING NEEDLE AND SEAT, IT IS ADVISABLE TO CHECK ALL RELATED PARTS IN CARBURETOR AND REPLACE OR REBUILD AS NEEDED"
2349 INPUT A$
2350 CLS
2351 PRINT "DETERMINE IF THE MAIN CARBURETOR CIRCUITS ARE WORKING: SPRAY CARB STARTER INTO AIR HORSE AND START ENGINE"

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```

3052 PRINT "IF ENGINE STARTS A
ND THEN DIES, ONE OF THE FOLLOWI
NG CONDITIONS MAY BE THE PROBLEM
...
3053 PRINT "
3054 PRINT " (VERY HOT AMBIENT TE
MPERATURES)"
3059 PRINT "
3060 PRINT " (COLD, HUMID AMBIENT
CONDITIONS)"
3063 PRINT "
3064 PRINT " (HIGH HUMIDITY, EXTRE
ME AMBIENT CHANGES OR INFREQUEN
T FILLING OFFUEL TANK)"
3065 INPUT A$
3070 CLS
3080 PRINT "VISIBLY INSPECT FO
R STICKING OR GUMMY LINKAGES AND
BUTTERFLIES."
3081 PRINT "CLEAN WITH CARBURE
TOR / LINKAGE SPRAY CLEANER"
3082 PRINT "CHECK ALL ELECTRIC
AL CONNECTIONS FOR CORROSION, OPE
N CIRCUITS."
3999 RETURN
4000 PRINT "
4001 PRINT "
4002 PRINT TAB 4;"ENTER NO. OF
CYL. =";
4003 INPUT NC
4004 PRINT NC
4005 CLS
4006 PRINT "ENTER COMPRESSION RE
ADINGS TAKEN"
4009 DIM A(NC)
4010 FOR T=1 TO NC
4011 INPUT A(NC)
4012 PRINT " PSI=";A(NC);
4013 IF A(NC)>LG THEN LET LG=A(N
C)
4014 IF A(NC)<SM THEN LET SM=A(N
C)
4015 LET SUM=SUM+A(NC)
4016 NEXT T
4017 IF CC=2 THEN GOTO 4060
4021 PRINT "TAB 0;"LOWEST READI
NG=";SM
4022 PRINT "HIGHEST READING=";LG
4023 LET PC=(LG-SM)/LG
4024 PRINT "MAX DROP=";PC;" (P
ERCENT)"
4025 IF PC>0.25 THEN PRINT "
4026 IF PC<0.25 AND PC>0.1 THEN
PRINT "
4027 IF PC<0.1 THEN PRINT "
4028 IF LG>200 THEN PRINT "
HIGH COMPRESSION"
4029 IF SM<100 THEN PRINT "
LOW COMPRESSION"
4030 PRINT "COMPARE READINGS A
GAINST SPECS."
4031 LET MEAN=SUM/NC
4032 PRINT "AVERAGE=";MEAN
4035 PRINT "IS COMPRESSION TOO
LOW? (Y/N)"
4036 INPUT A$
4040 IF A$="N" THEN GOTO 4100
4050 CLS
4051 PRINT "IF TWO ADJACENT CYLI
NDERS WERE VERY LOW, REPLACE HEA
D GASKET."
4052 PRINT "WET COMPRESSION TE
ST."
4053 PRINT "SQUIRT 2 TABLESPOONS
(ABOUT 25CC) OF MOTOR OIL INTO A
LOW CYLINDER AND RECHECK COMPRESS
ION."
4054 LET CC=2
4055 PRINT "ENTER NO. OF CYL.
TO RECHECK:"
4056 GOTO 4003
4060 PRINT "TAB 0;"IF READINGS
ARE IMPROVED, PISTON AND/OR PISTO
N RINGS ARE FAULTY."
4061 PRINT "IF NO IMPROVEMENT,
VALVE TRAIN IS PROBABLE CAUSE: CHE
CK VALVE SEATSGUIDES, CHAINS, ETC.
"
4070 GOTO 4500
4100 PRINT "IS COMPRESSION TOO H
IGH?"
4101 INPUT A$
4102 IF A$="N" THEN GOTO 4500
4103 CLS

```

```

4104 PRINT "CHECK FOR LIQUIDS IN
CYLINDERS. OIL OR WATER PRESENT
INDICATES THAT THE HEAD(S) MUS
T BE PULLED FOR VISUAL INSPECTIO
N."
4105 GOSUB 7000
4500 PRINT "END COMPRESSION TES
T"
4999 RETURN
5000 PRINT "CONNECT VACUUM GAUGE
TO INTAKE MANIFOLD ACCESS PORT"
5001 PRINT "START ENGINE AND REA
D AT IDLE."
5002 PRINT "
5003 PRINT "17-22 IN.HG." "NORMA
L" "10-16 IN.HG." "LATE TIMING
+OR" "LOW COMPRESSION"
5004 PRINT "10 IN.HG." "VACUU
M LEAK" "STUCK EGR VALVE" ">2
2 IN.HG." "EARLY IGNITION" "DR
IFTING" "MIXTURE TOO RICH"
5005 PRINT "FLUCTUATES" "STICK
Y VALVE OR" "IGNITION MISS"
5010 PRINT " * (IGNITION OR
VALVE TIMING)"
5100 INPUT A$
5101 CLS
5102 PRINT "GRADUALLY INCREASE E
NGINE RPM:"
5110 PRINT "
5111 PRINT "FLUCTUATES" "IGNITIO
N MISS" "HEAD GASKET" "LEAKING
VALVE" "VALVE SPRING"
5112 PRINT "GRADUAL DROP" "BAC
K PRESSURE"
5113 PRINT "15-20 IN.HG." "NOR
MAL"
5114 PRINT "
5115 PRINT "REV AND RELEASE THRO
TTLE QUICKLY"
5116 PRINT "NEEDLE SHOULD REGI
STER <5, THEN SNAP TO >25 AND DR
IFT BACK TO NORMAL."
5117 PRINT "IF NOT, CHECK EXHAU
ST SYSTEM FOR SOURCE OF BACK PRE
SSURE."
5999 RETURN
6000 PRINT "CONNECT TIMING LIG
HT AS PER MFG. INSTRUCTIONS, AND
CHECK STATIC (INITIAL) TIMING"
6001 PRINT "CHECK WITH + WITHO
UT DISTRIBUTER VACUUM TO CHECK AD
VANCER"
6002 PRINT "WITH DIST. VAC. LINE
OFF, CHECK THE ADVANCE AT DIFFERE
NT RPM TO TEST CENTRIFUGAL ADVANC
E MECHANISM"
6003 PRINT "COMPARE RESULTS WI
TH OEM SPECS."
6004 PRINT "
6999 RETURN
7000 PRINT "WITH STETHOSCOPE, (
OR FACSIMILE), LISTEN AT VALVE CO
VER FOR LOUD TAPPING. THIS CAN
LOCATE LIFTER THAT REQUIRE EXTRA
ATTENTION"
7002 PRINT "REMOVEREMOVE
COVERS, ATTEMPT TO DEPRESS LIFTER
BY HAND"
7003 PRINT "IF EASILY DEPRESSED,
REPLACE PART"
7005 PRINT "ADJUST VALVE LASH
TO OEM SPECS."
7006 PRINT "
7999 RETURN
8000 REM STACKS GOTO PROCEDURES
8001 IF A$="A" OR A$="C" THEN LE
T N=1000
8002 IF A$="A" OR A$="C" THEN LE
T X=1022
8003 IF A$="B" THEN LET N=1022
8004 IF A$="J" OR A$="K" OR A$="
F" OR A$="N" OR A$="L" THEN LET
N=1041
8005 IF A$="M" OR A$="P" OR A$="
D" OR A$="H" THEN LET N=1031
8006 IF A$="P" OR A$="H" OR A$="
D" THEN LET X=1041
8007 IF A$="H" OR A$="P" THEN LE
T Y=1051
8008 IF A$="E" OR A$="I" THEN LE
T N=1061
8009 IF A$="H" THEN LET Z=1081
8010 IF A$="G" THEN LET N=1051
8011 IF A$="G" THEN LET X=1061
8013 IF A$="H" THEN LET Q=1091

```



```

8014 IF A$="I" OR A$="N" THEN LE
T X=1071
8015 IF A$="P" THEN LET Z=1071
8016 IF A$="P" THEN LET Q=1081
8017 IF A$="J" THEN LET X=1051
8018 IF A$="K" OR A$="L" OR A$="
M" THEN LET X=1081
8019 IF A$="J" OR A$="N" THEN LE
T Y=1081
8020 IF A$="K" THEN LET Y=1091
8021 IF A$="N" THEN LET Z=1091
8025 IF A$="X" THEN GOTO 9900
8999 RETURN
9000 REM RESTACKS GOTO POSITIONS
9001 CLS
9002 LET N=X
9003 LET X=Y
9004 LET Y=Z
9005 LET Z=Q
9006 LET Q=U
9007 LET U=C
9008 LET C=Q
9009 IF N>1 THEN GOTO N
9010 GOTO 80
9100 SAVE "ANALYSIS"
9101 GOTO 1
9102 REM 1982,1984
9900 CLS
9901 PRINT AT 10,2;"EXIT ENGINE
ANALYSIS PROGRAM"
9999 STOP

```

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UPGRADING MTERM

80 Column Output

Tom Kalogerson

I have been using Mterm II and the 2050 modem to communicate with my factory in Florida. It was necessary for me to be able to send Tasword files, reports, etc., and also to have full size hard copy of the screen or buffer. It then became a challenge to make the program work with my Gemini 10X, especially since I do not have a 2040 printer.

By disassembling the program, I located the print routines for the 2040 and patched them to drive the 10X and an Aerco/Oliger printer port. The code is located from E4FAh to E5D1h, which is 216 bytes including a RET for a 2040 routine to make a 32 character blank line.

The end of the listing contains the control codes for the 10X, but you can install your own printer's codes there. This will give your output Tasword graphic control codes and print as such.

The beginning of the patch initializes the printer to center the text depending on the line width that you set in the terminal for video width. If there is no carriage return (such as, in Tasword files) this value will automatically send a <CR> for the correct line width.

Some printers require a line feed <LF> after a <CR>. The 10X does not, but you can poke a <LF> with a POKE 58777,10 (E599h,0Ah). Received Tasword graphic codes (80h to 8Fh) are pointed to the table located at the end of the listing (E5A2h to E5D1h) to get the three byte translation, which is then sent to the printer. If your printer requires only one code, and you wish to change the

LISTING FOR MTERM II PRINTER CHANGES FOR GEMINI 10X by Tom Kalogerson

```

*** CHANGE ***
D8D1      FROM: CALL Z,DE71      TO: JP Z,E4FA
55505     CCh 204d              CAh 202d
55506     71h 113d             FAh 250d
55507     DEh 222d             E4h 228d

Buffer Print-out Routine Starts Here - - at 58618d
E4FA 3E1B      LD A,1B          ;Set prnt code 27d
E4FC CD2BE5    CALL PRTA       ;Send to printer
E4FF 3E4D      LD A,4D          ;Set prnt code 77d
E501 CD2BE5    CALL PRTA       ;Send to printer
E504 EDSB05F1  LD DE,(F105);Get "video width"
E508 3E50      LD A,50          ;Ld A with 80d columns
E50A 93        SUB E            ;Subtract video width
E50B 1F        RRA              ;Divide by 2 for tab
E50C CD2BE5    CALL PRTA       ;Send to printer
E50F 010000    STRT LD BC,0000 ;Line lgth counter=0
E512 2AECEE    LD HL,(EEEC);Get end of buffer
E515 EDSBE8EE  LD DE,(EEEB);Get start of buffer
E519 ED52      SBC HL,DE        ;Lgth of buffer
E51B EB        EX DE,HL        ;HL=Buf strt,DE=length
E51C 7E        LD A,(HL)       ;Get first buffer char
E51D FE00      CP 00            ;Is buffer basic type?
E51F 2025      JR NZ,LP-3       ;If not, continue
E521 C5        SKIP PUSH BC     ;Save line lgth cntr
E522 0605      LD B,05         ;Set counter to 5
E524 23        INC HL          ;Skip next token
E525 1B        DEC DE          ;Dec prog count
E526 10FC      DJNZ,E524        ;Do it 5 times
E528 C1        POP BC          ;Restore counter
E529 1816      JR LP-2         ;Now continue
E52B F5        PRTA PUSH AF     ;Save code to send
E52C CD0920    BRK? CALL brek   ;Test break key
E52F 3805      JR C,E536       ;Continue:if no break
E531 F1        POP AF          ;Restore register and
E532 110100    LD DE,0001      ;Set buf count to one
E535 C9        RET             ;Return to term prog
E536 DB7F      IN A,(7F)       ;Get printer status
E538 CB67      BIT 4,A         ;Ready?
E53A 20F0      JR NZ,E52C      ;Loop until ready
E53C F1        POP AF          ;Restore code to send
E53D D37F      OUT (7F),A      ;Send it to printer
E53F C9        RET             ;Return to caller
E540 23        LP-1 INC HL      ;Next character
E541 7E        LP-2 LD A,(HL)  ;Put character in A

```

given values, then precede that code with two "nulls" or zeroes.

This routine won't give an Llist print-out of a Basic program, because there was not enough room to clear all of the keyword tokens.

The screen dump routine is loaded to 5F00h. Before calling the dump routine, the routine at E570h checks (Oliger port) to see if the printer is turned on. Any BREAK will hang the terminal program. You must restore the AF register with a POP AF and RET to get back into the program.

Finally, there are three POKES into Mterm in order to start and enable the printer routine, and these are given in line 115 of the Basic listing. This bootstrap loader is available from me for \$6.95 if you have any trouble. These are also eepromable as an Aros program as well. Lots of Luck!

```

5 BORDER 0: INK 5: PAPER 0: C
LS
7 PRINT "      MTERM II Bootstr
ap Loader"
8 PRINT "      by Tom Kalog
erson"
10 PRINT AT 6,0;"This program
will load MTERM II with correct
code for Gemini 10Xprinter. Thi
s includes the Gemini screen
dump at 24320."
15 PRINT AT 13,0;"For printers
with different control code
s, see instructions. This program
should be loaded first."
20 PRINT AT 20,0;"Press <ENTER
> to load."
80 PAUSE 4e4: CLS : FLASH 1: P
RINT INK 2;AT 10,11;"LOADING"
115 POKE 55505,228: POKE 55506,
250: POKE 55507,228
120 RESTORE 210: FOR b=24320 TO
24460: READ x: POKE b,x: NEXT b
125 RESTORE 220: FOR b=58618 TO
58834: READ x: POKE b,x: NEXT b
135 FLASH 0: CLS
137 PRINT AT 5,0;"MTERM is now
loaded with new code."
140 PAUSE 4e4
145 BORDER 7: INK 0: PAPER 7: C
LS
210 DATA 205,083,095,001,000,17
5,038,026,104,069,022,007,229,24
5,197,062,175,144,063,048,010,20
5,009,038,071,004,126,007,016,25
3,031,203,020,193,241,203,028,22
5,023,005,021,032,225,230,127,20
5,065,095,012,032,214,062,010,20
5,065,095,037,040,070,205,108,09
5,024,200,000,245,205,009,032,05
0,002,241,201,219,127,203,103,03
2,243,241,211,127,201,062,027,20
5,065,095,062,077,205,065,095,06
2,020,205,065,095,062,027,205,06
5,095,062,049,205,065,095,062,02
7,205,065,095,062,075,205,065,09
5,062,000,205,065,095,062,001,20
5,065,095,201,062,027,205,065,09
5,062,064,205,065,095,201
220 DATA 062,027,205,043,229,06
2,077,205,043,229,237,091,005,24
1,062,060,147,031,205,043,229,00
1,000,000,042,236,238,237,091,23
2,238,237,082,235,126,254,000,03
2,037,197,006,005,035,027,016,25
2,193,024,022,245,205,009,032,05
6,005,241,017,001,000,201,219,12
7,203,103,032,240,241,211,127,20
1,035,126,254,000,040,219,254,12
0,056,028,229,197,033,017,229,07
9,133,023,129,111,006,003,126,20
5,043,229,035,016,249,024,001,20
1,193,225,004,027,024,218

```

```

E542 FE00      CP 00      ;Check for type prog
E544 28DB      JR Z,SKIP   ;If basic skip next 5
E546 FE80      LP-3 CP 80   ;Is it a graphics char
E548 381C      JR C,SNDA   ;If not, print it
E54A E5        PUSH HL     ;Save buf register
E54B C5        PUSH BC     ;Save line lgth cntr
E54C 2111E5    LD HL E511  ;Begin table set-up
E54F 4F        LD C,A      ;Put graphics cd in C
E550 85        ADD A,L     ;Add L to A
E551 17        RLA         ;Times two
E552 81        ADD A,C     ;Plus graphics code
E553 6F        LD L,A      ;HL now points to tble
E554 0603      LD B,03     ;Counter to 3
E556 7E        LD A,(HL)   ;Get contr code number
E557 CD2BE5    CALL PRTA   ;Send to printer
E55A 23        INC HL      ;Next control code
E55B 10F9      DJNZ,E556   ;Loop three times
E55D 1801      JR E560     ;Jump over RET
E55F C9        RET        ;USED ONLY FOR MTERM
E560 C1        POP BC      ;Restore counter
E561 E1        POP HL      ;Restore buf register
E562 04        INC B       ;Inc line lgth counter
E563 1B        DEC DE      ;Dec buffer counter
E564 18DA      JR LP-1     ;Go get next character
E566 CD2BE5    SNDA CALL PRTA ;Print it
E569 04        INC B       ;Inc line lgth counter
E56A 1B        DEC DE      ;Dec buffer counter
E56B F5        PUSH AF     ;Save character
E56C 7A        LD A,D      ;Buffer count D into A
E56D B3        OR E        ;Or E
E56E 1809      JR E579     ;Jp over "screen dump"
Screen Print-out Routine Starts Here - - at 58736d
E570 DB7F      IN A,(7F)   ;Check printer,
E572 FEEF      CP EF       ;Is it turned on?
E574 C0        RET NZ      ;If not, ret to MTERM
E575 CD005F    CALL 5F00   ;Call "screen dump"
E578 C9        RET        ;Done, ret to MTERM
End of Screen Print-out
E579 200C      JR NZ,E587   ;Cont if counter not 0
E57B F1        POP AF      ;Restore stack
E57C 3E1B      LD A,1B     ;Set printer code 27d
E57E CD2BE5    CALL PRTA   ;Send to printer
E581 3E40      LD A,40     ;Ptrr reset code 64d
E583 CD2BE5    CALL PRTA   ;Send to printer
E586 C9        RET        ;Done, return to MTERM
E587 F1        POP AF      ;Restore character
E588 FE0D      CP OD       ;Was it a CR?
E58A 280C      JR Z,E598   ;If not,
E58C 3A05F1    LD A,(F105) ;Check video width,
E58F 3D        DEC A       ;Less one,
E590 B8        CP B        ;With line lgth count
E591 30AD      JR NC,LP-1   ;Next char, not at EQL
E593 3E0D      LD A,0D     ;Load A with CR
E595 CD2BE5    CALL PRTA   ;Send to printer
E598 3E00      LD A,00     ;Null (00) or LF (0A)
E59A CD2BE5    CALL PRTA   ;Send to printer
E59D 0600      LD B,00     ;Reset line lgth ctr
E59F 189F      JR LP-1     ;Go get next character
E5A1 00        NOP

```

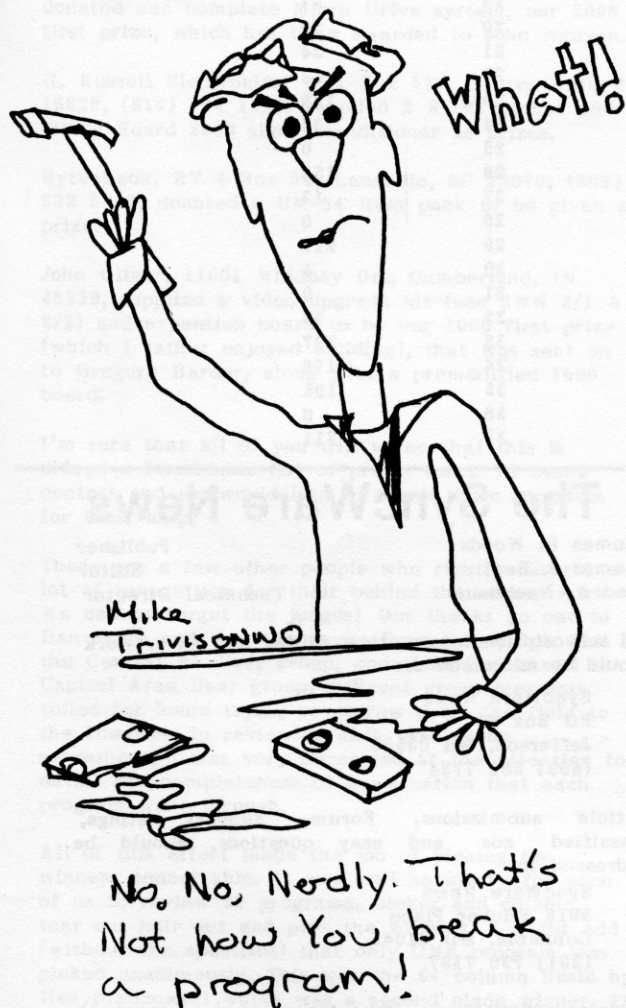
Control Code Translation Table
Three bytes/graphic code

REGISTER	HEX	DEC	GRAPHIC CODE	PRINTER FUNCTION
E5A2	58786	00 00		
E5A3	58787	00 00	80h 128d	on - Form feed
E5A4	58788	0C 12		
E5A5	58789	00 00		
E5A6	58790	00 00	81h 129d	off - Enlarged
E5A7	58791	14 20		
E5A8	58792	00 00		
E5A9	58793	00 00	82h 130d	off - Compressed
E5AA	58794	12 18		


```

230 DATA 205,043,229,004,027,24
,122,179,024,009,219,127,254,23
,192,205,000,005,201,032,012,24
,052,027,205,043,229,062,054,20
,043,229,201,241,254,013,040,01
,053,005,241,061,184,048,173,06
,010,205,043,229,062,000,205,04
,229,006,000,024,159,000,000,00
,012,000,000,020,000,000,018,02
,045,000,000,027,053,000,027,07
,000,027,072,027,066,001,027,06
,002,000,027,071,000,027,069,00
,027,052,027,045,001,000,000,01
,000,000,014,000,000,012
7999 STOP

```



E5AB	58795	1B	27			
E5AC	58796	2D	45	83h	131d	off - Underline
E5AD	58797	00	00			
E5AE	58798	00	00			
E5AF	58799	1B	27	84h	132d	off - Italics
E5B0	58800	35	53			
E5B1	58801	00	00			
E5B2	58802	1B	27	85h	133d	off - Emphisised
E5B3	58803	46	70			
E5B4	58804	00	00			
E5B5	58805	1B	27	86h	134d	off - DoubleStrike
E5B6	58806	48	72			
E5B7	58807	1B	27			
E5B8	58808	42	66	87h	135d	off - Elite
E5B9	58809	01	01			
E5BA	58810	1B	27			
E5BB	58811	42	66	88h	136d	on - Elite
E5BC	58812	02	02			
E5BD	58813	00	00			
E5BE	58814	1B	27	89h	137d	on - DoubleStrike
E5BF	58815	47	71			
E5C0	58816	00	00			
E5C1	58817	1B	27	8Ah	138d	on - Emphisised
E5C2	58818	45	69			
E5C3	58819	00	00			
E5C4	58820	1B	27	8Bh	139d	on - Italics
E5C5	58821	34	52			
E5C6	58822	1B	27			
E5C7	58823	2D	45	8Ch	140d	on - Underline
E5C8	58824	01	01			
E5C9	58825	00	00			
E5CA	58826	00	00	8Dh	141d	on - Compressed
E5CB	58827	0F	15			
E5CC	58828	00	00			
E5CD	58829	00	00	8Eh	142	on - Enlarged
E5CE	58830	0E	14			
E5CF	58831	00	00			
E5D0	58832	00	00	8Fh	143	on - Form Feed
E5D1	58833	0C	12			

PART 2: Retain Buffers & Macros

Kent E. Cook

I agree with the FORUM (3/1) about the disadvantages of the 2050. A user programmable RS-232 interface driving a separate modem is the most versatile combination. I use a Memotech RS232 I/F on my expanded ZX-81 system and have used it to transfer code to a commercial EPROM burner, for example, as well as driving a TRS-80 modem.

However, the price of the 2050 is dropping and the MTERM software has some interesting frills which make it attractive to someone who wants only to make 300 Baud dial-ups.

I was disappointed in having to load auto-dialer and macro settings every time I wanted to use them. The

extra time and trouble of loading nullified any benefit. HOT Z AROS and some head scratching showed an initialization routine at the start of the MTERM code which created and cleared the auto-dialer and macro settings during a cold start.

To change MTERM to load auto-dial settings and macros along with the program is easy. Load the program as usual. Set the paper, ink, and border colors to your tastes. Set the system parameters to match the protocol of your favorite dial-up service, and load or key in your auto-dial directory and macro information.

Exit to BASIC from the main menu and POKE 0's manually, or with a for-next loop in BASIC, into the

RAM addresses from 54066 to 54088, (D332 to D348 Hex) inclusive.

SAVE"mterm"CODE 54016,9216 a few times on a fresh tape and VERIFY. You now have an MTERM which will allow you enter from BASIC at the original address of 54016 (D300 Hex) without destroying any of your directory and macros! The extra length of the SAVE is, of course, the tables which were created in RAM by the original cold start routine and which must now be included on the tape.

The next step, if you so desire, is to put the new version on a dock cartridge. I didn't want to spend the effort to rewrite MTERM to run the code in EPROM and have the tables and variables in RAM. I also didn't want to interfere with the data buffer feature of MTERM.

The answer is having all the code in EPROM in a cartridge, copying it to RAM and then jumping to the start of the code. The next six bytes added to the code in the area cleared earlier tell the 2068 operating system to ignore the cartridge and allow full use of the MTERM buffer.

```
POKE 54066,151    Sub A
POKE 54067,211    Out (F4),A
POKE 54068,244
POKE 54069,50     Ld (5CC6),A
POKE 54070,198
POKE 54071,92
```

SAVE this latest version a few times!

The new version with auto-dial and macro tables included is over 8K bytes, so I chose a 27128 EPROM. I hope you have the JLO 2068 EPROM burner driven from HOT Z AROS. If you are driving the JLO programmer from BASIC, observe the precautions for burning 27128s! The modified version of MTERM from 54016 to 63231 (D300 to F6FF Hex) is burned into the 27128 from 7168 to 16383 (1C00 to 3FFF Hex).

The following is the AROS overhead and the code to copy MTERM into RAM and jump to it. Write or POKE it into a safe area of RAM, 32768+ (8000+ Hex), for instance, then burn it into the EPROM at 0 to 37 (0 to 25 Hex).

Install the EPROM in the cartridge mapped at 32768 (8000 Hex). With the cart installed in the dock, the 2068 should come up at power on with the MTERM title page. You will find all your settings, parameters, dial-up info. and macros intact. Exit to basic from the main menu and you should discover an empty BASIC programming area. Re-enter MTERM with RAND USR 54016 to restart the RAM resident code. This allows you to change settings during a session, exit to BASIC to manipulate the data in the buffer area, or whatever; and restart MTERM with the new settings preserved. A NEW from BASIC will cold start the cartridge and re-establish the settings programmed into the EPROM.

EPROM Addr:	Decimal Value:
0	1
1	2
2	8
3	128
4	207
5	1
6	0
7	0
8	0

Eprom Addr:	Decimal Value:
9	0
10	11
11	0
12	249
13	192
14	176
15	34
16	51
17	50
18	55
19	57
20	50
21	34
22	13
23	128
24	33
25	0
26	156
27	17
28	0
29	211
30	1
31	0
32	36
33	237
34	176
35	195
36	0
37	211

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Back issues of SWN are available for \$3.50 each. Volume #1 (for the 1000) is available for \$16.95.

SWN is done entirely on TS computers. Submissions are preferred as word processed text files (so we need not re-invent your article) on good tape. Memotext for the 1000 and 1500 and Mscript for the 2068 are preferred word processors. Documents submitted in Tasword Two and other word processors must be done in 52 column format. If you do not have a word processor, but you still have a good idea, then don't hesitate too work it up and submit it. SWN pays authors about \$40.00 per page for original articles. This amount will vary slightly from issue to issue and is paid when the article is published. Write for more information.

THE FAME & THE GLORY

And now, here are a few more words about the last contest. First, we would like to thank all of the contributors who donated prizes for this contest.

A&J Micro Drive, 1050 E. Duane Ave., Suite I
Sunnyvale, CA 94086, (408) 732 9292, graciously
donated one complete Micro Drive system, our 2068
first prize, which has been awarded to John Nguyen.

G. Russell Electronics, RD1 Box 539, Centre Hall, PA
16828, (814) 364 1325, supplied 2 ROMswitches and a
Winky Board 2000 signal conditioner as prizes.

Byte-Back, RT 4 Box 54, Leesville, SC 29070, (803)
532 5812, donated a UM-64 Ram pack to be given as a
prize.

John Oliger, 11601 Whidbey Dr., Cumberland, IN
46229, supplied a video upgrade kit (see SWN 2/1 &
2/2) and expansion board to be our 1000 first prize
(which I rather enjoyed building), that was sent on
to Gregory Harder, along with a premodified 1000
board.

I'm sure that all of you will agree that this is
indeed a formidable list of prizes for a TS based
contest and we would like to thank those suppliers
for their help.

There are a few other people who rightly deserve a
lot of recognition for their behind the scenes work.
We cannot forget the judges! Our thanks go out to
Dan Pinko and the Vancouver User group; Bob Heil and
the Central PA User group; and Mark Fisher and the
Capitol Area User group. Diligent group members
toiled for hours trying to narrow down the field to
the finalists. In reviewing each user group
scoresheet, I was very impressed at the attention to
detail and completeness of examination that each
program went through.

All of this effort made the job of picking the
winners conceivable. It was still necessary for each
of us to review 22 programs, bicker and quibble,
tear our hair out and pick the winners. I might add
(without the specifics) that only ONE program was
picked unanimously. This was the 64 column Basic by
Wes Brzozowski which was a second place winner. The
other winners were 2/1 splits. Suffice it to say
that contest judging, albeit fun, is NOT easy!

Meanwhile, we've been scratching our heads to come
up with ideas for the next GIANT CONTEST. Ideally,
the topic would be less general than the last
contest; judging such a broad range of programs was
very difficult, at best.

Here are a few topics that we came up with that
might make interesting and challenging topics for
both machines:

- 1: Interactive educational software for children.
- 2: Experimental AI (artificial intelligence)
programs and demos.
- 3: Communications programs (expanded modem
software, translation between machines,
cryptography, etc.)
- 4: Programs that solve a specific problem or
range of problems in the sciences, technology
or the arts.

We'll leave it to you, the reader. What kind of
contest would you be motivated to enter? Should
separate categories be assigned for TS1000 and
TS2068, BASIC and machine-code? Drop us a card and
let us know. We'll set up a special GIANT CONTEST
FILE, so please send contest suggestions separately
from other correspondence.

Oh yes! We have not forgotten the most important
group, all of the contestants. There were many fine
programs submitted. We will print as many of them as
we can and as soon as we can. For all of the non-
winners, fear not! SWN does indeed compensate for
submitted original articles as they are published.
However, please show the virtue of patience. We can
only work up just so many at a time.

Just so you don't forget who you are, here are all
of you!

Mark Stuebber, Mechanicsville, VA 23111
Harry D. Peters, Saxton, PA 16678
Michael Finn, Philadelphia, PA 19137
Richard Gold, Indian Head, MD 20640
Wes Brzozowski, Endicott, NY 13760
Robert Schubel, Rahway, NJ 07065
Richard Bredhoff, Brooklyn, NY 11236
John Headly, Tunkhannock, PA 18657
Ed Pardo, Hopatcong, NJ 07843
Ken Frankel, Hopatcong, NJ 07843
Stephen Jonke, Glen Arm, MD 21057
Ralph Vasko, Donora, PA 15033
M. E. LaVerne, Oakridge, TN 37830
John Nguyen, Louisville, KY 40213
Robert Fischer, Summerville, GA 30747
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Gary Cormonde, Leavenworth, KS 66048
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David Ellis, Austin, TX 78753

TS1500 HI☆RES

Gregory C. Harder

If you got my SW-LO-RES program up and running, then you are aware of the many graphic possibilities using low resolution. Now imagine what could be done with high resolution (256 x 192)! In this article I will give you the necessary information to set up a minimal high resolution operating system, which can be used to display user defined characters on the screen. With this information you should be able to develop a comprehensive high resolution operating system implementing such functions as plot, circle, draw, etc as I have done. [See end of article for further details].

Even though the routines presented here are "software only," they are hardware dependent. That is, due to hardware differences between the T/S 1000 (ZX81) and T/S 1500, they will only work correctly on a T/S 1500; hence the title of this article. In addition, the routines will only work on a T/S 1500 in which the 8K to 16K block of memory has been decoded, i.e. "Hunter" board, 64K ram, possibly other devices, such as EPROM readers, etc. Fred Nachbaur has reported that the routines will also work on an unexpanded (16K) T/S 1500, if the ROM is replaced with a T/S 1000 ROM. I have not tested this ROM switch, but if it works, this would be the least expensive method of making your T/S 1500 "hi-res compatible". [I only tested this on the one machine I have here; feedback about this from other users is encouraged. In principle, the "Bent ROM upgrade" should also work. It is available from G. Russell Electronics and from Thomas B. Woods, but will require a little modification to fit into the 24-pin socket of the TS1500. -fn See SWN 2/6 forum for these details.-ed.]

Before we continue, let's test your T/S 1500 to see if it is HI-RES compatible. Enter and run the short test program of listing 1. If you get a short, one pixel wide, line on the screen then it's OK to continue. On the other hand, if the screen fills with garbage, or turns black, then you will need to add a device to decode the 8-16K range, as mentioned above. Press any key to return to the normal display mode.

LISTING 1.

```
10 REM 12345
20 LET L=16514
30 POKE L,62
40 POKE L+1,32
50 POKE L+2,237
60 POKE L+3,71
70 POKE L+4,201
80 RAND USR L
90 PRINT CHR$ 1
100 PAUSE 4E4
110 POKE L+1,30
120 RAND USR L
```

Now replace lines 30 to 120 with listing 2, leaving lines 10 and 20 intact. Run the program and watch the display.

LISTING 2. BINARY CHR\$ DISPLAY

```
30 POKE L+1,32
40 RAND USR L
50 FOR N=0 TO 255
60 SCROLL
70 PRINT CHR$ N
80 NEXT N
90 PAUSE 4E4
100 POKE L+1,30
110 RAND USR L
```

Do you see what's happening? If you look carefully, you will notice that binary patterns are being displayed according to the following rules:

- A. Chr. codes 0 to 63, a direct binary equivalent of the chr. code is displayed.
- B. Chr. codes 64 to 127, the binary equivalent of the token word or unused chr. codes is displayed.
- C. Chr. codes 128 to 191, a complimented ("inverted") pattern is displayed.
- D. Chr. codes 192 to 255, the binary equivalent of the token words are displayed.

The significance of this is that 128 binary patterns are directly available, from 0000 0000 to 0111 1111. Binary patterns with bit 7 set are not available as these are interpreted by the ULA to be either a graphic character or a token character and it will, therefore, automatically output the inverted form or token word.

The absence of bit 7 will be the only disadvantage to using this method of producing a high resolution display. The advantages are that the missing bit is usually not needed for user defined characters, such as lower case letters. For example, the only Sinclair characters (excluding graphics) which use this bit are T and Y. For most graphic applications, if the plotting is not too dense, the missing bit is hardly noticeable.

How It Works

For a detailed explanation of the display system I recommend getting a copy of Mike Lords "Explorer's Guide to the Timex Sinclair 1500/1000".

What the above programs have done is altered the value of the I register, which is normally set to 1E(h), to point to the base address of the ROM character pattern table at 1E00(h). The machine code in REM line one is:

```
LD A,20
LD I,A
RET
```


The ULA can be fooled into reading the ROM patterns at a different base address by changing the contents of the I register. Change the POKE value in line 30 of listing 2 to a value from 0 to 29 to see what happens. For example, a value of 1 will set the base address of the character table to 0100(h). As you can see, the display is a random mess of bit patterns, depending on the binary contents of the new character table. Incidentally, most previous software-only high resolution programs use this method to access a different set of bit patterns for their displays.

What happens when the I register is set to 32 is a totally different mode of operation, since the ULA can't address a character table with a base address greater than the ROM itself.

My theory on how the binary patterns are produced is based on the fact that, according to Mike Lord:

"When a byte is being read from the display file the ULA chip forces the low 9 address lines to the ROM to a pattern consisting of:

The last 6 significant bits of the character code being read from the display (A0 to A5).

Three bits defining which of the eight scan lines for each row of characters is being generated (A6 to A8).

The high seven address lines are the high 7 bits of the Z80 I reg. (A9 to A15)."

Apparently, when I=32 the ULA has no where to go for a character pattern and instead outputs the contents of the lower six address lines, which happen to be the character codes obtained from the display file. This is probably also the reason that the routines do not work on a T/S 1000, if I=32 on a T/S 1000 these address lines will always appear to contain FF or 00.

LISTING 3: T/S 1500 HI*RES M.C. OPERATING SYSTEM.

ADDR	HEX CODE	NAME	ASSEMBLY	COMMENT
0000	0000	NRML	LD I,0	Set reg. I for normal display.
0001	0000	NRML	LD IX,0	Set reg. IX for normal display.
0002	0000	NRML	LD HL,0	Return with normal display set.
0003	0000	NRML	LD HL,0	Set reg. HL to RAMTOP.
0004	0000	NRML	LD HL,0	Test high byte of RAMTOP.
0005	0000	NRML	LD HL,0	Is it 103(d).
0006	0000	NRML	LD HL,0	Yes, then ret. RAMTOP lowered.
0007	0000	NRML	LD HL,0	No, restore normal display.
0008	0000	NRML	LD HL,0	Then give ERROR REPORT F.
0009	0000	NRML	LD HL,0	Report code F.
000A	0000	NRML	LD HL,0	Test if RAMTOP lowered.
000B	0000	NRML	LD HL,0	Test for HRD-FILE N/L marker.
000C	0000	NRML	LD HL,0	
000D	0000	NRML	LD HL,0	
000E	0000	NRML	LD HL,0	
000F	0000	NRML	LD HL,0	
0010	0000	NRML	LD HL,0	
0011	0000	NRML	LD HL,0	
0012	0000	NRML	LD HL,0	
0013	0000	NRML	LD HL,0	
0014	0000	NRML	LD HL,0	
0015	0000	NRML	LD HL,0	
0016	0000	NRML	LD HL,0	
0017	0000	NRML	LD HL,0	
0018	0000	NRML	LD HL,0	
0019	0000	NRML	LD HL,0	
001A	0000	NRML	LD HL,0	
001B	0000	NRML	LD HL,0	
001C	0000	NRML	LD HL,0	
001D	0000	NRML	LD HL,0	
001E	0000	NRML	LD HL,0	
001F	0000	NRML	LD HL,0	
0020	0000	NRML	LD HL,0	
0021	0000	NRML	LD HL,0	
0022	0000	NRML	LD HL,0	
0023	0000	NRML	LD HL,0	
0024	0000	NRML	LD HL,0	
0025	0000	NRML	LD HL,0	
0026	0000	NRML	LD HL,0	
0027	0000	NRML	LD HL,0	
0028	0000	NRML	LD HL,0	
0029	0000	NRML	LD HL,0	
002A	0000	NRML	LD HL,0	
002B	0000	NRML	LD HL,0	
002C	0000	NRML	LD HL,0	
002D	0000	NRML	LD HL,0	
002E	0000	NRML	LD HL,0	
002F	0000	NRML	LD HL,0	
0030	0000	NRML	LD HL,0	
0031	0000	NRML	LD HL,0	
0032	0000	NRML	LD HL,0	
0033	0000	NRML	LD HL,0	
0034	0000	NRML	LD HL,0	
0035	0000	NRML	LD HL,0	
0036	0000	NRML	LD HL,0	
0037	0000	NRML	LD HL,0	
0038	0000	NRML	LD HL,0	
0039	0000	NRML	LD HL,0	
003A	0000	NRML	LD HL,0	
003B	0000	NRML	LD HL,0	
003C	0000	NRML	LD HL,0	
003D	0000	NRML	LD HL,0	
003E	0000	NRML	LD HL,0	
003F	0000	NRML	LD HL,0	
0040	0000	NRML	LD HL,0	
0041	0000	NRML	LD HL,0	
0042	0000	NRML	LD HL,0	
0043	0000	NRML	LD HL,0	
0044	0000	NRML	LD HL,0	
0045	0000	NRML	LD HL,0	
0046	0000	NRML	LD HL,0	
0047	0000	NRML	LD HL,0	
0048	0000	NRML	LD HL,0	
0049	0000	NRML	LD HL,0	
004A	0000	NRML	LD HL,0	
004B	0000	NRML	LD HL,0	
004C	0000	NRML	LD HL,0	
004D	0000	NRML	LD HL,0	
004E	0000	NRML	LD HL,0	
004F	0000	NRML	LD HL,0	
0050	0000	NRML	LD HL,0	
0051	0000	NRML	LD HL,0	
0052	0000	NRML	LD HL,0	
0053	0000	NRML	LD HL,0	
0054	0000	NRML	LD HL,0	
0055	0000	NRML	LD HL,0	
0056	0000	NRML	LD HL,0	
0057	0000	NRML	LD HL,0	
0058	0000	NRML	LD HL,0	
0059	0000	NRML	LD HL,0	
005A	0000	NRML	LD HL,0	
005B	0000	NRML	LD HL,0	
005C	0000	NRML	LD HL,0	
005D	0000	NRML	LD HL,0	
005E	0000	NRML	LD HL,0	
005F	0000	NRML	LD HL,0	
0060	0000	NRML	LD HL,0	
0061	0000	NRML	LD HL,0	
0062	0000	NRML	LD HL,0	
0063	0000	NRML	LD HL,0	
0064	0000	NRML	LD HL,0	
0065	0000	NRML	LD HL,0	
0066	0000	NRML	LD HL,0	
0067	0000	NRML	LD HL,0	
0068	0000	NRML	LD HL,0	
0069	0000	NRML	LD HL,0	
006A	0000	NRML	LD HL,0	
006B	0000	NRML	LD HL,0	
006C	0000	NRML	LD HL,0	
006D	0000	NRML	LD HL,0	
006E	0000	NRML	LD HL,0	
006F	0000	NRML	LD HL,0	
0070	0000	NRML	LD HL,0	
0071	0000	NRML	LD HL,0	
0072	0000	NRML	LD HL,0	
0073	0000	NRML	LD HL,0	
0074	0000	NRML	LD HL,0	
0075	0000	NRML	LD HL,0	
0076	0000	NRML	LD HL,0	
0077	0000	NRML	LD HL,0	
0078	0000	NRML	LD HL,0	
0079	0000	NRML	LD HL,0	
007A	0000	NRML	LD HL,0	
007B	0000	NRML	LD HL,0	
007C	0000	NRML	LD HL,0	
007D	0000	NRML	LD HL,0	
007E	0000	NRML	LD HL,0	
007F	0000	NRML	LD HL,0	
0080	0000	NRML	LD HL,0	
0081	0000	NRML	LD HL,0	
0082	0000	NRML	LD HL,0	
0083	0000	NRML	LD HL,0	
0084	0000	NRML	LD HL,0	
0085	0000	NRML	LD HL,0	
0086	0000	NRML	LD HL,0	
0087	0000	NRML	LD HL,0	
0088	0000	NRML	LD HL,0	
0089	0000	NRML	LD HL,0	
008A	0000	NRML	LD HL,0	
008B	0000	NRML	LD HL,0	
008C	0000	NRML	LD HL,0	
008D	0000	NRML	LD HL,0	
008E	0000	NRML	LD HL,0	
008F	0000	NRML	LD HL,0	
0090	0000	NRML	LD HL,0	
0091	0000	NRML	LD HL,0	
0092	0000	NRML	LD HL,0	
0093	0000	NRML	LD HL,0	
0094	0000	NRML	LD HL,0	
0095	0000	NRML	LD HL,0	
0096	0000	NRML	LD HL,0	
0097	0000	NRML	LD HL,0	
0098	0000	NRML	LD HL,0	
0099	0000	NRML	LD HL,0	
009A	0000	NRML	LD HL,0	
009B	0000	NRML	LD HL,0	
009C	0000	NRML	LD HL,0	
009D	0000	NRML	LD HL,0	
009E	0000	NRML	LD HL,0	
009F	0000	NRML	LD HL,0	
00A0	0000	NRML	LD HL,0	
00A1	0000	NRML	LD HL,0	
00A2	0000	NRML	LD HL,0	
00A3	0000	NRML	LD HL,0	
00A4	0000	NRML	LD HL,0	
00A5	0000	NRML	LD HL,0	
00A6	0000	NRML	LD HL,0	
00A7	0000	NRML	LD HL,0	
00A8	0000	NRML	LD HL,0	
00A9	0000	NRML	LD HL,0	
00AA	0000	NRML	LD HL,0	
00AB	0000	NRML	LD HL,0	
00AC	0000	NRML	LD HL,0	
00AD	0000	NRML	LD HL,0	
00AE	0000	NRML	LD HL,0	
00AF	0000	NRML	LD HL,0	
00B0	0000	NRML	LD HL,0	
00B1	0000	NRML	LD HL,0	
00B2	0000	NRML	LD HL,0	
00B3	0000	NRML	LD HL,0	
00B4	0000	NRML	LD HL,0	
00B5	0000	NRML	LD HL,0	
00B6	0000	NRML	LD HL,0	
00B7	0000	NRML	LD HL,0	
00B8	0000	NRML	LD HL,0	
00B9	0000	NRML	LD HL,0	
00BA	0000	NRML	LD HL,0	
00BB	0000	NRML	LD HL,0	
00BC	0000	NRML	LD HL,0	
00BD	0000	NRML	LD HL,0	
00BE	0000	NRML	LD HL,0	
00BF	0000	NRML	LD HL,0	
00C0	0000	NRML	LD HL,0	
00C1	0000	NRML	LD HL,0	
00C2	0000	NRML	LD HL,0	
00C3	0000	NRML	LD HL,0	
00C4	0000	NRML	LD HL,0	
00C5	0000	NRML	LD HL,0	
00C6	0000	NRML	LD HL,0	
00C7	0000	NRML	LD HL,0	
00C8	0000	NRML	LD HL,0	
00C9	0000	NRML	LD HL,0	
00CA	0000	NRML	LD HL,0	
00CB	0000	NRML	LD HL,0	
00CC	0000	NRML	LD HL,0	
00CD	0000	NRML	LD HL,0	
00CE	0000	NRML	LD HL,0	
00CF	0000	NRML	LD HL,0	
00D0	0000	NRML	LD HL,0	
00D1	0000	NRML	LD HL,0	
00D2	0000	NRML	LD HL,0	
00D3	0000	NRML	LD HL,0	
00D4	0000	NRML	LD HL,0	
00D5	0000	NRML	LD HL,0	
00D6	0000	NRML	LD HL,0	
00D7	0000	NRML	LD HL,0	
00D8	0000	NRML	LD HL,0	
00D9	0000	NRML	LD HL,0	
00DA	0000	NRML	LD HL,0	
00DB	0000	NRML	LD HL,0	
00DC	0000	NRML	LD HL,0	
00DD	0000	NRML	LD HL,0	
00DE	0000	NRML	LD HL,0	
00DF	0000	NRML	LD HL,0	
00E0	0000	NRML	LD HL,0	
00E1	0000	NRML	LD HL,0	
00E2	0000	NRML	LD HL,0	
00E3	0000	NRML	LD HL,0	
00E4	0000	NRML	LD HL,0	
00E5	0000	NRML	LD HL,0	

[illegible]

User Defined Graphics for the TS1500

Since we can now access 128 binary patterns all that is needed is to set up a high resolution operating system to use them. The minimal operating system presented in listing 3 will do this for you.

To start you will need a REM line of at least 704 bytes. Although the operating system is only 192 bytes long we need an additional 512 bytes to hold the UDG character patterns. You can enter the REM line by hand, or alternately, use listing 4 which will do this task for you. In addition, an area of ram at least 6336 bytes long will also be needed, to hold the high resolution display file. This will be done by lowering RAMTOP prior to running the routines.

Once the REM line has been entered, use a hex loader, or listing 5, to enter the hex code as shown in listing 3. After this is done, continue loading from data table 1, this is a table containing 512 bytes which define 64 characters (eight bytes per character). When all of this is done, POKE 16510,0 to change REM line 1 to 0 (makes it impossible to accidentally delete or edit). Remove all lines greater than zero, then enter the lines from listing 6. These are your USR calls, variables, and constants. You may have to POKE S-TOP with 10 to prevent listing of line 0 each time (POKE 16419,10). You should now have the basic system ready for use, make at least two copies on tape.

Before we can proceed with the demo program, RAMTOP has to be lowered to make room for the HRD-FILE. POKE 16389,103 then "NEW". Reload the basic operating system, then enter the lines from listing 7.

LISTING 4. REM GENERATOR.

[illegible]

LISTING 5: HEX LOADER.

[illegible]


```

100  FOR I=0 TO 255
110  FOR J=0 TO 255
120  PRINT CHR$(I);CHR$(J);
130  NEXT J
140  PRINT
150  NEXT I
160  END

```

```

100  FOR I=0 TO 255
110  FOR J=0 TO 255
120  PRINT CHR$(I);CHR$(J);
130  NEXT J
140  PRINT
150  NEXT I
160  END

```

The Demo Program

Lines 100 to 220 display an inventory of all the possible binary patterns available. Lines 230 to 470 first display the new UDG characters followed by the normal Sinclair characters. Lines 480 to 700 print out a string text in which the graphic characters are displayed as their normal Sinclair characters and all others as the new UDG characters.

General Notes

If you use these routines to write your own basic program and it stops, keep in mind that the HRD-FILE is being displayed and you will not, therefore, see any of the normal error reports. If your program stops you will have to "RAND USR NRML" to get back to the normal display mode.

```

100  FOR I=0 TO 255
110  FOR J=0 TO 255
120  PRINT CHR$(I);CHR$(J);
130  NEXT J
140  PRINT
150  NEXT I
160  END

```

In general, the HRD-FILE obeys the same rules as the normal display file. You can POKE a value directly to it, but beware of sending a character with bit 6 set (CHR\$ 64-127 and 192-255) or you will crash. Also be careful that you don't overwrite an endline marker (analogous to the normal display file, except that the HR end-marker is CHR\$ 201 = RET instead of CHR\$ 118 = HALT).

I hope you find these routines interesting and can find useful ways of utilizing the HI*RES capabilities of the T/S 1500.

SUMMARY OF THE M.C. ROUTINES.

LABEL

NRML Restores normal display mode

HRES Displays the contents of the HRD-FILE.

CLS- Clears the HRD-FILE.

PRNT This is equivalent to PRINT AT Y,X;VAL. The normal Sinclair display file consists of 24 lines by 32 characters, however, this routine maps the HRD-FILE as 192 lines by 32 characters. VAL is the value of the binary character to be displayed.

Y=contents of address 16508 (0 to 191).
X=contents of address 16507 (0 to 31).
VAL=contents of address 16417 (0 to 255).

A print coordinate of X=0,Y=0 will be the upper left corner, X=0,Y=191 the bottom left, X=31,Y=0 the upper right and X=31,Y=191 the lower right.

ADDR This routine calculates the print position within the HRD-FILE corresponding to the "Y,X" coordinates of PRNT.

SORT This converts VAL to the correct binary form for printing.

HRIX Takes over control from the normal display system to produce a HRES display of 192 lines by 32 characters.

ERROR CONDITIONS

When using these routines the following error reports may occur:

REPORT ERROR CONDITION

F File error, RAMTOP not lowered.

V Vertical parameter out of range (Y>191).

H Horizontal parameter out of range (X>31).

```

100 REM ** BINARY PATTERNS
110 REM ** USUALLY MADE
120 REM ** WORK
130 REM ** G=0 TO 2
140 REM ** A=0 TO 191 STEP 2
150 REM ** Y=0
160 REM ** VAL=N
170 REM ** PRINT
180 REM ** N=N+1
190 REM ** THEN GOTO 230
200 REM ** A=N/25
210 REM ** G
220 REM ** PRINT UDCG THEN NOR-
230 REM ** MAL CHARACTERS.
240 FOR N=0 TO 200
250 NEXT N
260 REM ** USUALLY
270 REM ** USUALLY
280 REM ** USUALLY
290 REM ** USUALLY
300 REM ** USUALLY
310 REM ** USUALLY
320 REM ** USUALLY
330 REM ** USUALLY
340 REM ** USUALLY
350 REM ** USUALLY
360 REM ** USUALLY
370 REM ** USUALLY
380 REM ** USUALLY
390 REM ** USUALLY
400 REM ** USUALLY
410 REM ** USUALLY
420 REM ** USUALLY
430 REM ** USUALLY
440 REM ** USUALLY
450 REM ** USUALLY
460 REM ** USUALLY
470 REM ** USUALLY
480 REM ** USUALLY
490 REM ** USUALLY
500 REM ** USUALLY
510 REM ** USUALLY
520 REM ** USUALLY
530 REM ** USUALLY
540 REM ** USUALLY
550 REM ** USUALLY
560 REM ** USUALLY
570 REM ** USUALLY
580 REM ** USUALLY
590 REM ** USUALLY
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800 REM ** USUALLY
810 REM ** USUALLY
820 REM ** USUALLY
830 REM ** USUALLY
840 REM ** USUALLY
850 REM ** USUALLY
860 REM ** USUALLY
870 REM ** USUALLY
880 REM ** USUALLY
890 REM ** USUALLY
900 REM ** USUALLY
910 REM ** USUALLY
920 REM ** USUALLY
930 REM ** USUALLY
940 REM ** USUALLY
950 REM ** USUALLY
960 REM ** USUALLY
970 REM ** USUALLY
980 REM ** USUALLY
990 REM ** USUALLY

```

```

475 REM ** PRINT CARS IN WHICH
480 REM ** CARS = GRAPHIC
490 REM ** CARS = NORMAL
500 REM ** CARS = NORMAL
510 REM ** CARS = NORMAL
520 REM ** CARS = NORMAL
530 REM ** CARS = NORMAL
540 REM ** CARS = NORMAL
550 REM ** CARS = NORMAL
560 REM ** CARS = NORMAL
570 REM ** CARS = NORMAL
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590 REM ** CARS = NORMAL
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810 REM ** CARS = NORMAL
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900 REM ** CARS = NORMAL
910 REM ** CARS = NORMAL
920 REM ** CARS = NORMAL
930 REM ** CARS = NORMAL
940 REM ** CARS = NORMAL
950 REM ** CARS = NORMAL
960 REM ** CARS = NORMAL
970 REM ** CARS = NORMAL
980 REM ** CARS = NORMAL
990 REM ** CARS = NORMAL

```

NOTE: Mr. Harder has written a machine-code HI-RES EXTENDED BASIC package for the TS1500 based on his discovery. Included are PLOT, UNPLOT, DRAW, UNDRAW, CIRCLE, UNCIRCLE, SCROLL UP/DOWN, INVERT, FLASH, and several other commands. PRINT allows printing normal Sinclair characters, or either of two UDG sets. SWDF, WINDOWA and WINDOWB allow transferring

full or partial contents of the normal DF to the HRDF. The complete package is available at a price of \$19.95 from Fred Nachbaur (Silicon Mountain Computers) at the address on the masthead. A 64-column package will also be available in the future, drop a card if you wish to be placed on the "inform when ready" list.

SEND A 2068 MESSAGE

P. H. Skipper.

As is well known, the 2068 computer will print something on the screen from a BASIC program through the use of a PRINT statement. If it is desired to print a message in the lower part of the screen one can use a statement such as:

```
1010 PRINT #1;AT 0,0;"Message"
```

It is also possible to print messages from machine code. After all, if the computer can send those *helpful* little error messages, it must have a routine in the ROM somewhere for doing so.

This routine does exist and is located at address 073Fh (1855d). It is so important that it has been named. Ray Kingsley's HOT Z calls it "msgs"; the Timex ROM disassembly, "PUTMES"; and The Complete SPECTRUM ROM Disassembly, by Logan and O'Hara, "PO-MSG." (In the SPECTRUM it is located at 0C0Ah.) But it doesn't matter what it's called. If it is called as a subroutine from machine code, then it will print a message in the lower part of the screen.

Before it can be called, however, two items of information must be provided so that it knows where to find the message it is to print. These items are loaded into the Z-80's A register and the DE register-pair using machine code as follows:

1) LD A,sequence number. The "sequence number" is one less than the number of the desired message in a string of messages. Its range is from 0 through 255. For example, if a string contains ten messages and it is desired to print the fifth one, then load A with 04h. To print the first message in the string, or if there is only one message, load A with 00h.

2) LD DE,base address. The "base address" is the address at which the message or the string of messages starts. The term "start" is defined as the address of the initial non-printing character of the message (see below).

Furthermore, to enable the message-printing routine to do its job, the message string must be written in a certain way:

1) The code of the first character in the string must equal or exceed 80h (128d). This first character will not be printed, but the routine will seek it out and begin counting messages from that point. If the code of the first character is too low, it and the following characters will be ignored and the message-printing routine will run down the message string without printing until it does find a code equal to or greater than 80h. It will then start printing with the character which follows this code. It will also fail to properly count the messages in a string of messages. The address of this first character is defined as the "start" of the message, although the actual message begins one address later. If the address just before the actual message should happen to contain a code which is 80h or greater, such as C9h for RETURN, then this address can be used as the "start" address with the actual message following immediately thereafter.)

2) The code of the last character in each message must also equal or exceed 80h in order to tell the message-printing routine when it has come to the end of the message. This is achieved by adding 80h to the normal code of the desired last character of the message.

For example, suppose the last character is "?" with a code of 3Fh (63d). Adding 80h (128d) will give a code of BFh (191d) to be used as the last code of the message. The "?" will be printed, as desired. This "big" code will also be used by the message-counting procedure to select the requested message from within a string of messages.

As an illustration of the use of this routine, Figure 1 gives a BASIC program which will load the appropriate machine code to provide three messages, one of which can be selected by you. Type in the BASIC program, SAVE it and RUN it. It will ask you which message number is to be printed. 1, 2, or 3 are the only acceptable replies.

The decimal codes for the three messages are contained in Lines 330, 350, and 370, respectively. Codes for any other messages can be substituted, but

Figure 1.

```

1 REM "Send a Message"
2 GO TO 100
10 INPUT "Msg Nr? ";A
20 IF A<1 OR A>3 THEN GO TO 10
30 LET A=A-1
40 POKE 64001,A
50 RANDOMIZE USR 64000
60 GO TO 10
100 RESTORE
200 FOR i=64000 TO 64076
210 READ c
220 POKE i,c
230 NEXT i
300 REM MC Program:
310 DATA 62,0,17,11,250,205,63,
7,195,47,14
320 REM Msg 1:
330 DATA 128,77,101,115,115,97,
103,101,32,35,49,160
340 REM Msg 2:
350 DATA 77,101,115,115,97,103,
101,32,35,50,160
360 REM Msg 3:
370 DATA 84,104,111,117,103,104,
116,32,116,104,105,115,32,119,1
11,117,108,100,32,98,101,32,77,1
15,103,32,35,51,44,32,32,32,100,
105,100,110,39,116,32,121,97,63,
160
400 DELETE ,3
410 GO TO 10

```

Line 200 may then have to be modified to accommodate the length of the data to be loaded. Note that lines 1 and 2 evaporate when the program is first RUN.

If HOT Z is available (and it should be to anyone serious about machine code), then the code can be written directly, following the disassembly in Figure 2. A short BASIC program can then be modeled on Lines 10 through 60 of Figure 1 to demonstrate the code.

Figure 2.

ADDR	HEXCODE	LABEL	MNEMONIC
FA00	3E00		LD A,00
FA02	110BFA		LD DE,FA0B
FA05	CD3F07		CALL msg1
FA08	C32F0E		JP 0E2F
FA0B	80		ADD A,B
FA0C	4D		LD C,L
FA0D	65		LD H,L
FA0E	73		LD (HL),E
FA0F	73		LD (HL),E
FA10	61		LD H,C
FA11	67		LD H,A
FA12	65		LD H,L
FA13	2023		JR NZ,FA38
FA15	31A04D		LD SP,4DA0
FA18	65		LD H,L
FA19	73		LD (HL),E
FA1A	73		LD (HL),E
FA1B	61		LD H,C
FA1C	67		LD H,A
FA1D	65		LD H,L
FA1E	2023		JR NZ,FA43
FA20	32A054		LD (54A0),A
FA23	68		LD L,B
FA24	6F		LD L,A
FA25	75		LD (HL),L
FA26	67		LD H,A
FA27	68		LD L,B
FA28	74		LD (HL),H
FA29	2074		JR NZ,FA9F
FA2B	68		LD L,B
FA2C	69		LD L,C
FA2D	73		LD (HL),E
FA2E	2077		JR NZ,FAA7
FA30	6F		LD L,A
FA31	75		LD (HL),L
FA32	6C		LD L,H
FA33	64		LD H,H
FA34	2062		JR NZ,FA98
FA36	65		LD H,L
FA37	204D		JR NZ,FA86
FA39	73		LD (HL),E
FA3A	67		LD H,A
FA3B	2023		JR NZ,FA60
FA3D	33		INC SP
FA3E	2C		INC L
FA3F	2020		JR NZ,FA61
FA41	2064		JR NZ,FAA7
FA43	69		LD L,C
FA44	64		LD H,H
FA45	6E		LD L,(HL)
FA46	27		DAA
FA47	74		LD (HL),H
FA48	2079		JR NZ,FA33
FA4A	61		LD H,C
FA4B	3F		CCF
FA4C	A0		AND B

In the machine-code program, the routine is ended at FA08h with a jump into the main execution loop of the ROM instead of using RET. This is because if RET is used then, upon returning, the usual "STOP" or "OK" message will immediately overwrite the message which was written by the machine-code routine.

The 2068 ROM is replete with messages to practice on. Some message-strings lie at:

3C89h Cassette messages.
0F65h Report ("Error") messages.
0095h Token table (Use the routine at 0745h to print tokens instead of the message printing routine).

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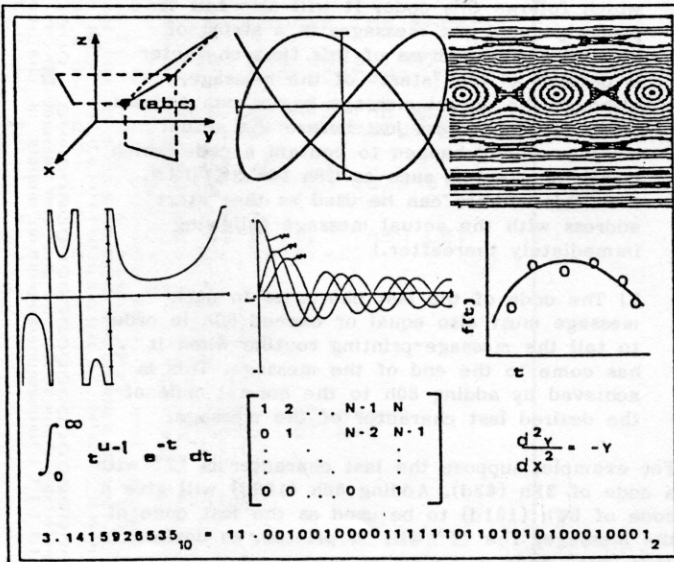
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